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ARIZONA DEPARTMENT
OF WATER RESOURCES
BULLETIN 2

APPRAISAL OF WATER RESOURCES IN THE **UPPER VERDE RIVER AREA** YAVAPAI AND COCONINO COUNTIES, ARIZONA

BY SANDRA J. OWEN-JOYCE AND C.K. BELL

PREPARED BY THE GEOLOGICAL SURVEY · UNITED STATES DEPARTMENT OF THE INTERIOR

ARIZONA DEPARTMENT OF WATER RESOURCES BULLETINS

The following reports are available for distribution at the Arizona Department of Water Resources, 99 East Virginia, Phoenix, and at U.S. Geological Survey offices in: Federal Building, 301 West Congress Street, Tucson, and Suite 1880, Valley Center, Phoenix.

No.

1. Geohydrology and water use in southern Apache County, Arizona, by L. J. Mann and E. A. Nemecek: 86 p., 5 pls., 3 figs., 1983.

2. Appraisal of water resources in the upper Verde River area, Yavapai and Coconino Counties, Arizona, by S. J. Owen-Joyce and C. K. Bell: 219 p., 3 pls., 11 figs., 1983.

ARIZONA DEPARTMENT OF WATER RESOURCES
BULLETIN 2

APPRAISAL OF WATER RESOURCES IN THE UPPER VERDE RIVER AREA, YAVAPAI AND COCONINO COUNTIES, ARIZONA

By
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Prepared by the GEOLOGICAL SURVEY
UNITED STATES DEPARTMENT OF THE INTERIOR

Phoenix, Arizona
March 1983

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Terms used in the report are defined below. The definitions were adapted from Baldwin and McGuinness (1963), Langbein and Iseri (1960), Lohman and others (1972), and U.S. Water Resources Council (1980).

Aquifer — A geologic formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Artesian aquifer — See confined aquifer.

Base flow — Ground water that has been discharged into a stream channel as spring or seepage water.

Confined aquifer — An aquifer that lies between layers of less permeable rock and in which ground water is confined under pressure significantly greater than atmospheric. Static water levels in wells that penetrate a confined aquifer are higher than the top of the aquifer. Synonym: artesian aquifer. See also unconfined aquifer.

Consumptive use — The quantity of water absorbed by crops and transpired or used directly in the building of plant tissue together with that evaporated from the cropped area.

Contaminant — Any physical, chemical, biological, or radiological substance or matter in water. U.S. Environmental Protection Agency drinking-water regulations express limits as "maximum contaminant levels."

Direct runoff — Water that enters stream channels promptly after rainfall or snowmelt.

Discharge of ground water — The processes by which water leaves an aquifer.

Evapotranspiration — Water withdrawn from a land area by evaporation from water surfaces and moist soil and by plant transpiration.

Flow line — The path that a particle of water follows in its movement through saturated, permeable rocks.

Ground-water divide — A ridge in the water table or other potentiometric surface from which ground water moves away in both directions.

Head — The height above a standard datum of the surface of a column of water that can be supported by the static pressure at a given point in an aquifer. In this report, datum used is National Geodetic Vertical Datum of 1929. See potentiometric surface.

Hydraulic conductivity — The volume of water that will move in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow. Hydraulic conductivity describes the ability of the aquifer material to transmit water and may have substantially different values for horizontal and vertical flow through the same material.

Hydraulic gradient — The change in head per unit of distance in a given direction.

Intermittent stream — One which flows only at certain times of the year when it receives water from springs or from some surface source, such as melting snow in mountainous areas. Synonym: seasonal.

National Geodetic Vertical Datum of 1929 (NGVD of 1929) — A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called mean sea level.

Potentiometric surface — An imaginary surface representing the static head of ground water, of which the water table is one type. The potentiometric surface for a confined aquifer is the level at which water would stand in wells producing from that aquifer.

Perched ground water — Unconfined ground water separated from an underlying body of ground water by an unsaturated zone and held up by a bed of rock with a low permeability.

Perennial stream — One which flows continuously.

Recharge — The processes of addition of water to the zone of saturated rock.

Specific capacity — The rate of discharge of water from the well divided by the drawdown of the water level within the well.

Storage — Water naturally detained in an aquifer, artificial impoundment of water in an aquifer, or the water so impounded.

Transmissivity — The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient. Transmissivity describes the ability of the entire thickness of an aquifer to transmit water and is the product of hydraulic conductivity and saturated thickness.

Unconfined aquifer — An aquifer in which only part of the permeable rock is saturated. Synonym: water-table aquifer. See also confined aquifer.

Water budget — An accounting of the inflow to, outflow from, and storage changes in an aquifer.

Water table — The surface in an unconfined aquifer below which the rocks are saturated with water. The water table is the level at which water stands in wells that penetrate the uppermost part of an unconfined aquifer. See potentiometric surface.

Water-table aquifer — See unconfined aquifer.

CONVERSION FACTORS

For readers who prefer to use metric units rather than inch-pound units, the conversion factors for the terms used in this report are listed below:

Multiply inch-pound unit	By	To obtain metric unit
inch (in.)	25.4	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
acre	0.4047	hectare (ha)
square mile (mi^2)	2.590	square kilometer (km^2)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
acre-foot (acre-ft)	0.001233	cubic hectometer (hm^3)
acre-foot per acre (acre-ft/acre)	0.3047	cubic meter per square meter (m^3/m^2)
foot squared per day (ft^2/d)	0.0929	meter squared per day (m^2/d)
gallon per minute (gal/min)	0.06309	liter per second (L/s)
gallon per minute per foot [(gal/min)/ft]	0.207	liter per second per meter [(L/s)/m]
ton per day (ton/d)	0.9072	megagram per day (Mg/d)
degree Fahrenheit (°F)	(temp °F-32)/1.8	degree Celsius (°C)

APPRAISAL OF WATER RESOURCES IN THE UPPER VERDE RIVER AREA, YAVAPAI AND COCONINO COUNTIES, ARIZONA

By

Sandra J. Owen-Joyce and C. K. Bell

ABSTRACT

Population growth in the upper Verde River area is occurring mostly in the Verde Valley where development of additional water supplies will eventually depend on ground water from the regional aquifer. The availability of surface water for use is limited owing to downstream water rights. Ground water occurs in a thick sequence of flat-lying limestone and sandstone that underlies most of the 2,600-square-mile project area. The regional aquifer includes the alluvium along the Verde River, Verde Formation, Coconino Sandstone, Supai Formation, Naco Formation, Redwall Limestone, Martin Formation, and Tapeats Sandstone. Ground water flows downgradient toward the Verde River. Depth to water generally is less than 800 feet below the land surface. Wells that tap these rock units produce from less than 10 to 1,600 gallons per minute. Where present, faulting, fracturing, and solution cavities increase well yields. Other aquifers provide local perched sources of water from volcanic rocks, granitic rocks, alluvium, Kaibab Limestone, and Toroweap Formation in parts of the Black Hills and Plateau uplands.

The ground-water budget comprises 111,000 acre-feet of base flow discharged from the area as surface water, 35,000 acre-feet lost to evapotranspiration, 31,000 acre-feet of surface water consumed by irrigated crops, and 8,000 acre-feet of ground water withdrawn primarily for public and domestic use. Continued ground-water development will eventually decrease the base flow in the streams because of the close association between ground water and surface water. Because no storage facilities for floodflows exist, this decrease will affect the surface-water uses in the Verde Valley as well as the amount of water available to downstream water users.

Ground water and surface water are of acceptable chemical quality for most uses except for the water obtained near Camp Verde. Dissolved-solids, sulfate, arsenic, and fluoride concentrations in the ground water from the Verde Formation and alluvium exceed the maximum contaminant levels for drinking water as recommended by the U.S. Environmental Protection Agency and the State of Arizona. Dissolved solids exceed 500 milligrams per liter throughout most of the Verde Formation. Concentrations are as much as 97,700 milligrams per liter but generally are less than 5,000 milligrams per liter. Sulfate concentrations exceed the maximum contaminant level of 250 milligrams per liter near

Middle Verde and Camp Verde owing to the presence of evaporite minerals in the Verde Formation. Sulfate concentrations are as much as 64,700 milligrams per liter but generally are less than 2,900 milligrams per liter. Large concentrations of arsenic occur in some wells and springs that tap the Verde Formation from Cornville and Rimrock to Camp Verde. Arsenic concentrations in this part of the area ranged from 1 to 240 micrograms per liter, and about 30 percent exceeded the maximum contaminant level of 50 micrograms per liter. Rock samples of the Verde Formation from this same area contained from 7 to 88 micrograms per gram of arsenic; the largest concentrations are associated with clay. Arsenic is disseminated throughout the formation rather than confined to a particular bed. Near Camp Verde and Middle Verde, water from nine wells exceeds the maximum contaminant level for fluoride and is as much as 3.4 milligrams per liter. In all the streams except Bitter Creek and the Verde River downstream from Camp Verde, the surface-water quality is well suited for irrigation, its primary use. Mine drainage contaminates Bitter Creek. The salinity hazard is medium to high in the Verde River downstream from Camp Verde. The increase in dissolved solids, mostly sodium and sulfate, is from ground water discharged from the Verde Formation and alluvium.

INTRODUCTION

During recent years, the Verde Valley has experienced a rapid growth in population and a concurrent increase in water-resources development. The increase in population is closely associated with the growing interest in this area as a retirement location. The Verde River, numerous lakes, Indian ruins, and spectacular scenery make this a popular tourist and recreation area. Surface water is used primarily for irrigation and recreation, but surface-water use is limited in the area owing to downstream water rights. Ground water serves as the major source of public and domestic water, and future development probably will depend on this water supply. The increasing demand for water prompted an appraisal of the water resources in the upper Verde River area. The study was made by the U.S. Geological Survey in cooperation with the Arizona Department of Water Resources.

Ground-water and surface-water resources cannot be considered separately in the upper Verde River area. Discharge from the regional aquifer maintains the flow of the perennial streams in the area. Large-scale ground-water development would ultimately decrease the low-flow surface outflow from the basin.

Purpose of the Investigation and Scope of the Report

The purpose of the investigation was to define the ground-water system, determine the low-flow characteristics of streams in the area, evaluate the relation between ground water and surface water, and

determine the extent of development and its effects on the ground-water system. The report describes: (1) the distribution, structure, and lithology of the geologic units that underlie the area and their relation to the occurrence, movement, availability, and chemical quality of ground water; (2) the base flow, low-flow frequency, flow duration, and chemical quality of water in the Verde River and its perennial tributaries; and (3) a ground-water budget for the regional aquifer.

Location of the Area

The upper Verde River area is in north-central Arizona and overlaps the Central highlands and the Plateau uplands water provinces (fig. 1). This area occupies about 2,600 mi^2 of Yavapai and Coconino Counties. The main population centers are in the Verde Valley near Cottonwood, Camp Verde, Clarkdale, and Sedona.

Physiography and Climate

The study area includes the northern valley of the Verde River; the valley is bounded by the escarpment of the Mogollon Rim to the north and northeast and by the Black Hills to the southwest. The Mogollon Rim escarpment, which is the boundary between the Plateau uplands province and the Central highlands province, is a steeply sloping cliff that rises 1,000 to 2,000 ft from the Verde Valley floor to altitudes of 5,500 to 7,500 ft above the National Geodetic Vertical Datum of 1929 at the upper edge of the escarpment (fig. 1). The rim is cut by steep-walled canyons, and south of the rim is a landscape of buttes and mesas. The plateau altitudes are about 6,000 ft near the rim to 9,256 ft at Bill Williams Mountain. The Black Hills, part of the Central highlands province, rise to 7,834 ft in the north at Woodchute Mountain and to 6,525 ft in the south at Squaw Peak (fig. 1).

The Verde River is the main stream that drains the study area and enters the area in T. 17 N., R. 1 W. The river flows along the foot of the Black Hills eastward to Perkinsville then southeastward where it leaves the study area at its confluence with Fossil Creek. Altitudes along the Verde River range from about 4,240 ft where the Verde River enters the study area to about 2,540 ft where the river flows out of the study area.

The major perennial tributaries to the Verde River are Sycamore Creek, Oak Creek, Beaver Creek, West Clear Creek, and Fossil Creek. These tributaries drain the region north and east of the Verde River and flow in a southwesterly direction toward the Verde River. Most streams that drain the Black Hills and the northwestern part of the study area flow only in response to rainfall or snowmelt. Perennial flow in the Verde River and its major tributaries is maintained by ground-water discharge.

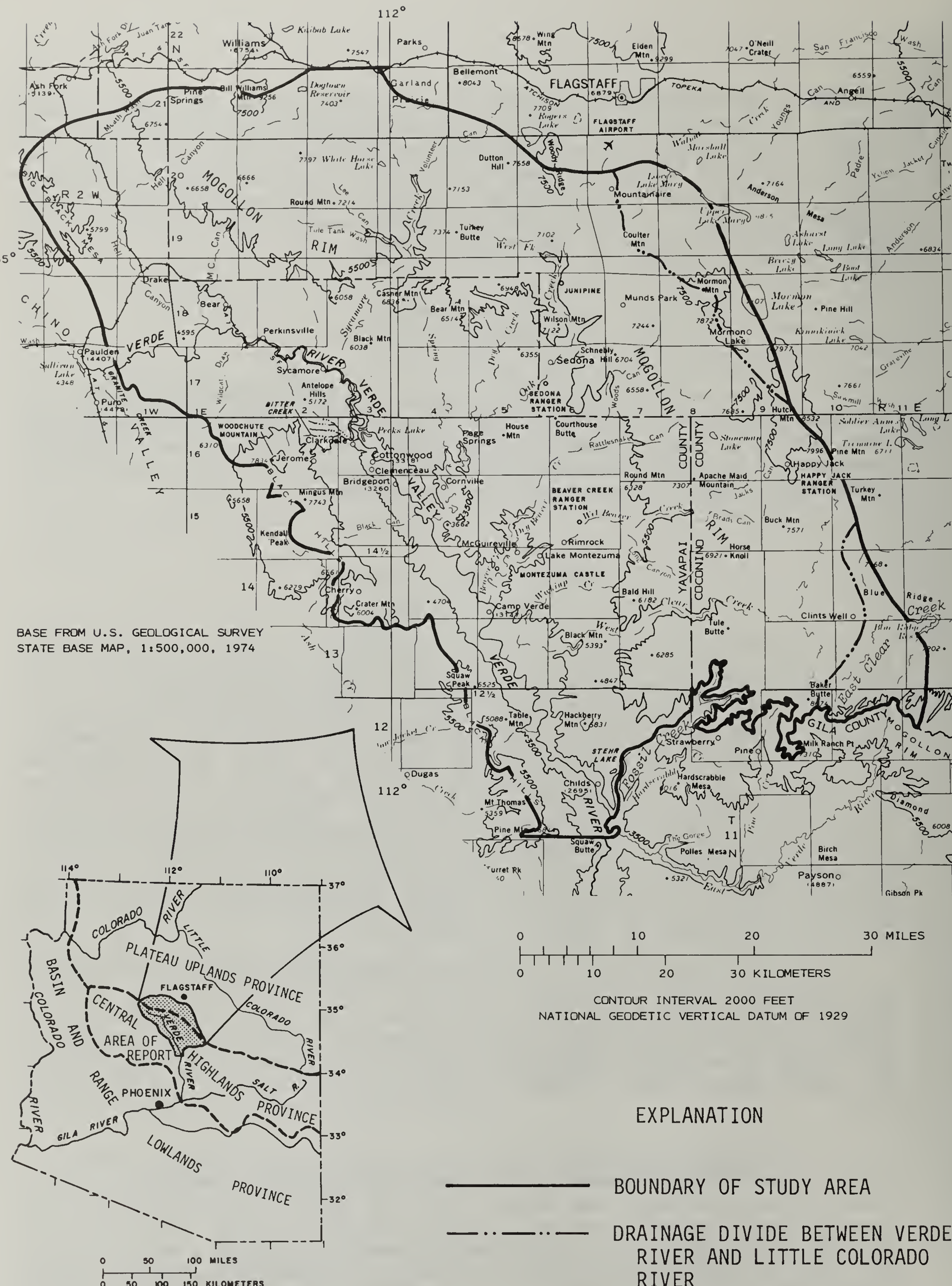


Figure 1.--Area of report and Arizona's water provinces.

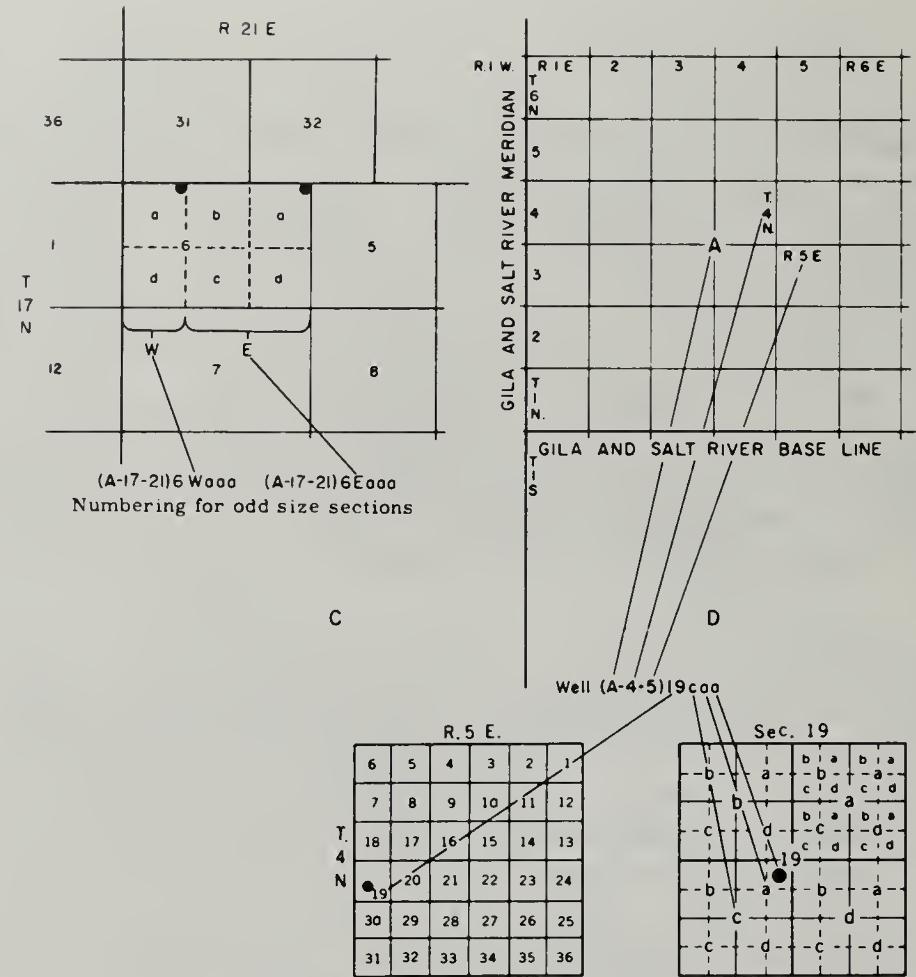
The Mogollon Rim and the Black Hills influence the climate of the area. Moisture-laden airmasses, on encountering these topographic features, rise, cool, and precipitate moisture. Annual precipitation ranges from 18 to 26 in. near the rim and in the Plateau uplands, the highest values occur along the rim (Sellers and Hill, 1974). Annual snowfall is about 40 to 85 in. (Sellers and Hill, 1974, p. 208 and 276). Jerome, the only weather station in the Black Hills, receives about 18 in. of precipitation and 25 in. of snowfall per year. In the Verde Valley precipitation ranges from 12 to 17 in. per year, and snowfall is negligible. The average annual temperature ranges from 43°F at Happy Jack Ranger Station to 62°F at Cottonwood (Sellers and Hill, 1974).

Precipitation is seasonal; during the winter, storms associated with frontal systems bringing moisture from the Pacific Ocean traverse the area from west to east. These storms spread rainfall of light to moderate intensity across large parts of the southwestern United States from late October through April. Precipitation often occurs as rain at the lower elevations in the Verde Valley and as snow at higher elevations along the Mogollon Rim, on the plateau, and on the Black Hills. Winter storms have been the cause of many of the major floods in this area, particularly when warm rain falls on snow. The highest runoff during a year commonly occurs in March and April as a result of snowmelt. High flows are less common in May and early June between the winter and summer storm seasons than during any other part of the year. The second precipitation season is during the summer when moist tropical air sweeps in from the south. Precipitation at this time of year often occurs as short-duration, locally intense thunderstorms that are common from late June through early October and often cause local flash flooding.

Methods of Investigation

The fieldwork on which this report is based was done in 1976-80. Hydrologic data collected prior to this investigation and selected data collected by other agencies are included in the hydrologic data tables at the end of the report. An inventory was made of wells and springs, and water levels in wells were measured where possible (tables 10, 11, and 12). Well and spring locations are described in accordance with the well-numbering system used in Arizona, which is explained and illustrated in figure 2. The altitudes of wells and springs were obtained from U.S. Geological Survey topographic maps at scales of 1:24,000 or 1:62,500. Water samples were collected from selected wells, springs, and streamflow sites (tables 13 and 14). Drill cuttings were collected and analyzed for arsenic in areas where large concentrations of arsenic occurred in water samples.

The geologic map is generalized from existing geologic maps (pl. 1). In areas of intense faulting only the major faults are shown. In the upper Verde River area many of the individual rock units or



The well numbers and letters used by the Geological Survey in Arizona are in accordance with the Bureau of Land Management's system of land subdivision. The land survey in Arizona is based on the Gila and Salt River meridian and base line, which divide the State into four quadrants. These quadrants are designated counterclockwise by the capital letters A, B, C, and D. All land north and east of the point of origin is in A quadrant, that north and west is in B quadrant, that south and west in C quadrant, and that south and east in D quadrant. The first digit of a well number indicates the township, the second the range, and the third the section in which the well is situated. The lowercase letters a, b, c, and d after the section number indicate the well location within the section. The first letter denotes a particular 160-acre tract, the second the 40-acre tract, and the third the 10-acre tract. These letters are also assigned in a counterclockwise direction, beginning in the northeast quarter. If the location is known within the 10-acre tract, three lowercase letters are shown in the well number. In the example shown in figure 2, well number (A-4-5)19caa designates the well as being in the NE¼NE¼SW¼ sec. 19, T. 4 N., R. 5 E. Where there is more than one well within a 10-acre tract, consecutive numbers beginning with 1 are added as suffixes.

When a section is more than 1 mile in any dimension, the section number applies as usual. The oversized section is divided so that a full square-mile unit of the section is adjacent to a normal section within the same township; the remainder is considered as a separate unit of land. Appropriate N., S., E., or W. letters are assigned to the units, depending upon where they lie in relation to the full square-mile unit. A well would be designated as shown in figure 2 with the appropriate letter following the section number in which the well is located.

Figure 2.--Well-numbering system in Arizona.

formations are hydraulically connected and function as a single water-bearing unit; therefore, they were grouped for mapping in order to reflect this relation.

Precambrian metamorphic and granitic rocks were mapped as a single unit. Paleozoic and Mesozoic rocks were divided into three map units on the basis of hydrologic and lithologic characteristics and mappable size. The rocks of the regional aquifer were grouped into two map units. The Coconino Sandstone, Supai Formation, and Naco Formation were grouped as the first map unit; the Redwall Limestone, Martin Formation, and Tapeats Sandstone were grouped as the second map unit. The rocks that lie above the regional aquifer—the Toroweap Formation, Kaibab Limestone, and Moenkopi Formation—are the third map unit. Rocks of Tertiary age are divided into sedimentary rocks, volcanic rocks, and the Verde Formation. Sedimentary rocks include the sedimentary rocks of Krieger (1965; 1967a, b), the Hickey Formation (Anderson and Creasey, 1958), and the Perkinsville Formation (Lehner, 1958). Volcanic rocks include the basalts, cinders, and associated volcanic sediments of the Hickey Formation, Perkinsville Formation, Verde Formation, and the intermediate basalt of Lehner (1958). The Verde Formation is a significant part of the regional aquifer and is mapped as a separate unit. Two Quaternary units, alluvium and gravel, are shown. The alluvium along the Verde River is hydraulically connected to the regional aquifer. The gravel does not contain water but crops out over a large area.

Lithologic and drillers' logs of wells were examined to determine the thickness, physical characteristics, and water-yielding potential of the rock units. Selected drillers' logs are listed in table 15. Additional drillers' logs have been published for southern Coconino County (McGavock, 1968), for the Verde Valley (Twenter and Metzger, 1963), and for the Sedona area (Levings, 1980), and deep stratigraphic test-hole information appears in Peirce and Scurlock (1972).

Streamflow records were collected at 11 existing gaging stations, and the Verde River near Camp Verde gaging station was reactivated as a base-flow station from July 1, 1976, to October 1, 1979. The base-flow data from a gaging station on the Verde River below Camp Verde was not used because irrigation ditches on both sides of the river often carry more water than the river, which makes the data meaningless. Floods isolated the below Camp Verde gage, and since January 1, 1979, it has been operated as a high-flow station.

A seepage investigation was made along the Verde River from Clarkdale to the confluence with Fossil Creek on June 11-13, 1979. Discharge measurements were made at 20 sites on the main stem of the Verde River and at 35 sites on tributary streams and irrigation diversions and returns (pl. 3). A previous low-flow investigation (not part of this study) had been made along the Verde River from Paulden to Camp Verde on June 20-22, 1977, but did not include the irrigation diversions and returns between Clarkdale and Camp Verde.

Previous Investigations

The initial hydrologic study of the Verde Valley was made by Twenter and Metzger (1963) in which they reported on the ground-water resources and geology of the region. Ground water of the Mogollon Rim region was studied by Feth and Hem (1963) during their investigation of springs. Ground-water basic data for southern Coconino County is available in McGavock (1968). Geohydrologic studies on specific sections of the study area include Lake Mary (Harshbarger and Associates, 1976; 1977) and Sedona (Levings, 1980). The Verde Valley was studied as a potential geothermal-resource area using the chemical character of ground water as an indicator (Ross and Farrar, 1980). Basic data have been compiled as maps showing the ground-water conditions in the upper Verde River area (Levings and Mann, 1980). Evapotranspiration losses were determined from flood-plain areas of central Arizona (Anderson, 1976). Water-quality data are available for Oak Creek (Obr and others, 1970) and West Clear Creek (Sommerfeld and others, 1976). The U.S. Forest Service has published information on the hydrology of the Beaver Creek watershed (Brown and others, 1974). Flood studies and high-flow information are available for the study area (U.S. Geological Survey, 1973; U.S. Army Corps of Engineers, 1976; Roeske, 1978; and Anderson and White, 1979).

Geologic studies were made of the ore deposits located in the region (Anderson and Creasey, 1958; Lehner, 1958; Krieger, 1965), the geologic history of the basin and the lake deposits (Blake, 1890; Jenkins, 1923; Mears, 1948; Mahard, 1949; Wadell, 1972), and stratigraphy (McKee, 1938; McKee and Gutschick, 1969; Nations, 1974).

Acknowledgments

The authors gratefully acknowledge the cooperation of the many residents of the area who granted permission to work on their property and supplied information about their wells. Special appreciation is extended to the well drillers, water companies, and State agencies who furnished information for the study. Special thanks are due to Mr. Richard E. Lewis of the California Institute of Technology for furnishing a copy of his unpublished geologic map of the area between the Verde River and Hackberry Mountain, Mr. J. E. Alam of the Soil Conservation Service for the estimate of consumptive use of water on irrigated acreage for the area, and Mr. Timothy D. Love of the Arizona Department of Health Services for the water-quality information on Bitter Creek.

GEOLOGIC SETTING

The part of the upper Verde River area in the Plateau uplands province is underlain by a sequence of almost flat-lying sedimentary rock units overlain in places by volcanic rocks and alluvium (pl. 1). The oldest Paleozoic rock unit exposed in this part of the study area is the

Redwall Limestone, which is along the Oak Creek fault (Levings, 1980). Several oil- and gas-test holes and a few water wells indicate the Redwall Limestone is underlain by the Martin Formation, Tapeats Sandstone, and Precambrian granitic rocks. Rock units that overlie the Redwall Limestone are the Supai Formation, Coconino Sandstone, Toroweap Formation, and Kaibab Limestone. The Naco Formation crops out along Fossil Creek, which is the northwest limit of its deposition, where it interfingers with the Supai Formation. The Moenkopi Formation crops out near the Mormon Mountain anticline, near the northeast boundary of the area, and along Sycamore Canyon. Tertiary rocks lie unconformably on older rock units. The Tertiary rocks include the Hickey Formation, Perkinsville Formation, intermediate basalt west of Black Mountain (Lehner, 1958), unnamed volcanic rocks and associated sediments in the northwest corner of the area (Krieger, 1965; 1967a, b), and the Tertiary basalts of Moore and others (1960) and Twenter and Metzger (1963) in the north and east parts of the area. Alluvium occurs locally along stream channels.

In the Black Hills, volcanic rocks overlie metamorphic, granitic, and flat-lying sedimentary rocks, which locally are tilted by faulting. The Black Hills contain the only outcrops of Precambrian rocks in the area (pl. 1). Paleozoic sedimentary rocks lie unconformably on the Precambrian rock units and include the Tapeats Sandstone, Martin Formation, Redwall Limestone, and Supai Formation. Tertiary rocks lie unconformably on the Paleozoic rocks and include the basalt flows and sediments of the Hickey Formation, Perkinsville Formation, and unnamed sedimentary and volcanic rocks (Krieger, 1965; 1967a, b).

The Verde Valley is underlain by rock units of Tertiary and Quaternary age. The Verde Formation, which covers about 325 mi^2 of the valley, is a deposit of mudstone, limestone, and sandstone that contains interbedded volcanic rocks that are exposed along the east and south margins of the valley. Wells drilled near the boundaries of the Verde Formation penetrate the surrounding flat-lying sedimentary rocks found below the Mogollon Rim and in the Black Hills. The deepest hole, which was drilled in the south-central part of the valley, was 1,625 ft deep and bottomed in 225 ft of basalt flows. What underlies the basalts is unknown. Alluvium occurs along the channels and flood plains of major streams. Gravel overlies the Verde Formation between the Black Hills and the Verde River.

Description of the Water-Bearing Rock Units

For the purpose of this report, the rock units that are of interest are those from which water can be obtained. The following summaries describe the rock units from oldest to youngest. The complete stratigraphy and more detailed lithologic descriptions appear on plate 1.

The rocks of Precambrian age include 20,000 feet of metamorphosed volcanic and tuffaceous sedimentary rocks (Anderson and Creasey, 1958, p. 9), which are intruded by granitic to dioritic rocks. The Precambrian rocks are faulted and fractured.

The Tapeats Sandstone of Cambrian age unconformably overlies the Precambrian rock units and ranges in thickness from 0 to 150 ft. The lower part is a medium-grained to very coarse grained crossbedded sandstone with lenses of conglomerate cemented by silica and iron oxide. Where siliceous cement is dominant, the rock unit is hard, almost a quartzite. The lower part grades upward into a shaly siltstone and limy or dolomitic mudstone that are moderately cemented with siliceous and calcareous cement.

The Tapeats Sandstone and the overlying Martin Formation of Devonian age appear to be in gradational contact. The 500 ft of Martin is mainly a dolomitic limestone, although locally at the base is lenticular sandstone. The dolomitic limestone is fine to coarse grained. The lower part of the unit contains interbeds of shale and a silica cemented sandstone bed, which ranges in thickness from 1 to 3 ft. The uppermost part contains shaly mudstone and platy siltstone.

The Redwall Limestone of Mississippian age unconformably overlies the Martin Formation and contains 35 ft of reworked Martin at its base. The Redwall is mainly a massive, coarse-grained, and crystalline limestone, which ranges in thickness from 0 to 300 ft. Beds differ in thickness from thin bedded in the lower one-third to thick bedded in the upper two-thirds. Some beds within the Redwall Limestone are highly fractured and contain solution channels and caverns formed along joints or bedding planes, or at random.

The Redwall Limestone is overlain primarily by the Supai Formation of Pennsylvanian and Permian age except in the extreme southeastern part of the study area along Fossil Creek where it is unconformably overlain by the only outcrop of Naco Formation of Pennsylvanian age seen in the area. The Naco Formation is 475 ft thick and interfingers with the Supai Formation. The Naco Formation is a limy siltstone and fine-grained sandstone with a few interbeds of limestone and at the base is a layer of sandy shale and chert breccia.

The Supai Formation was laid down on a karst-type erosion surface of the Redwall Limestone. Lenticular beds of a basal conglomerate contain pebbles derived from the Redwall Limestone. The Supai is divided into three members (Huddle and Dobrovolny, 1945). The lower member, which is 1,100 ft thick, contains alternating beds of sandstone, siltstone, and some limestone in the upper part and siltstone with some shaly mudstone and a few beds of limestone conglomerate, limestone, and sandstone in the lower part. At the base is a chert breccia or limestone conglomerate. The middle member, which is 300 ft thick, contains alternating beds of siltstone, mudstone, and sandstone and at the base a limestone bed. In the upper section of the member, lenticular beds of dolomitic intraformational conglomerate contain well-rounded limestone pebbles in a siltstone matrix. Some siltstone beds are calcareous. The dolomitic and calcareous beds are subject to solution as indicated by sinkholes in the Sedona area. The upper member, which is 625 ft thick, is a sequence of very fine to coarse-grained sandstone beds and a few interbedded siltstone beds. The sandstone is friable, some is calcareous,

and the beds are thick and massive. Near Sedona, a sandy limestone bed 10 to 15 ft thick can be seen. The bed thins and pinches out to the west.

The contact between the Supai Formation and the Coconino Sandstone of Permian age is gradational. A transition zone, which is about 50 to 150 ft thick, is light-colored crossbedded sandstone similar to the Coconino, alternating with dark-colored siltstone similar to the Supai. The contact has been placed arbitrarily at the top of the uppermost horizontally bedded siltstone layer in order that the Coconino contains no siltstone beds.

The Coconino Sandstone is a very fine grained to fine-grained massive sandstone unit. The degree of cementation varies, but generally the Coconino is well cemented by silica, although some calcium carbonate also is present as cement. This unit is 650 ft thick and is characterized by large-scale crossbeds that are as much as 50 ft long. In some areas, the unit exhibits jointing or fracturing and parting along the planes of the crossbeds.

The Toroweap Formation of Permian age, which is as much as 350 ft thick, conformably overlies the Coconino Sandstone. The Toroweap has horizontal bedding and smaller crossbeds than the Coconino. The lower part is a massive fine-grained to coarse-grained sandstone. Some beds are calcareous and others clayey. The upper part contains alternating layers of friable and soft sandstone, siltstone, and some shaly mudstone that grade eastward to noncalcareous sandstone.

The Kaibab Limestone of Permian age unconformably overlies the Toroweap Formation. It is a limestone or dolomitic limestone. To the northwest, some beds are fine-grained massive calcareous sandstone and are somewhat friable. The unit, which is about 400 ft thick, is fractured and contains solution fissures and caverns.

An unconformity separates the Moenkopi Formation of Triassic age from the underlying Kaibab Limestone. The Moenkopi ranges in thickness from 0 to 400 ft and consists of siltstone, mudstone, claystone, and sandstone with a conglomerate at the base. The mudstone and claystone in the upper part contain stringers of gypsum.

The volcanic rocks of Tertiary age vary in thickness and are mainly basalt and andesite flows, basaltic dikes, cinder cones, and sedimentary rocks composed of volcanic material. The rocks are distributed irregularly over the study area and unconformably overlie rocks that range in age from Precambrian to Tertiary (pl. 1). The flows are characteristically faulted and jointed and locally contain layers of clay and weathered ash. The coarser interbedded sedimentary rocks exhibit more porosity than the clay and weathered ash.

The Verde Formation of Tertiary age consists of sediment that was deposited in a lake. Its thickness ranges from 0 to at least 1,800 ft (Twenter and Metzger, 1963, p. 55), but the maximum thickness

is unknown. The lithology of the beds varies, and most beds are lenticular. Six facies are assigned to the formation (Twenter and Metzger, 1963): the thick limestone facies; upper, middle, and lower limestone facies; the mudstone facies; and the sandstone facies. The thick limestone facies is found in the central part of the Verde Valley and is composed of limestone and marl. The limestone is soft, marly, and chalk-like when fresh but becomes hard and resistant when weathered. Beds range in thickness from 6 in. to 5 ft. This facies intertongues with all the other facies (Twenter and Metzger, 1963, p. 50). The upper, middle, and lower limestone facies, which are mainly limestone and marl, are similar except for their position in the section. Beds are 1 to 10 ft thick and contain solution channels. The upper limestone facies is porous owing to hollow calcified plant stems. The upper, middle, and lower limestone facies radiate out from the central thick limestone facies. The mudstone facies consists of mudstone and claystone but becomes sandy and silty in places. Beds are less than 1 in. to 5 ft thick. In the southwestern part of the valley, the mudstone facies contains evaporite minerals and south of Wingfield Mesa is interbedded with tuffaceous sedimentary rocks, conglomerate, volcanic ash, and clay. The mudstone facies is reported to intertongue with the lower and middle limestone facies, whereas the sandstone facies intertongues with the middle and upper limestone facies. The sandstone facies consists of very fine to fine-grained sandstone and siltstone composed mainly of quartz and interbedded with some mudstone, claystone, and limestone. Along the margin of the valley, the sandstone facies is mainly conglomerate. The limestone beds of the formation are jointed and contain solution channels. The sandstones are friable, and the mudstones contain salt and gypsum deposits.

The Quaternary alluvium comprises channel, flood-plain, and terrace deposits found near the stream channels. The channel and flood-plain deposits are poorly sorted gravel, sand, silt, and clay, and the terrace deposits are finely stratified clay, silt, sand, and gravel. The alluvium along the streams ranges in thickness from a few feet to about 50 ft.

In the area around Munds Park, the alluvium is as much as 400 ft thick. The alluvium is composed of black and brown clay interbedded with cinders, volcanic gravel, and volcanic ash.

Structure

Structural features bound the east and west sides of the upper Verde River area. The Mormon Mountain anticline (pl. 1), which is the northeastern ground-water divide, is asymmetrical, and the southwestern limb dips toward the Verde Valley. No dips greater than 4° have been measured except where associated with a fault. The Black Hills on the west were uplifted along northwestward-trending normal faults, and the rock units dip gently toward the basin. Tertiary and Quaternary rock units in the Verde Valley are nearly horizontal or dip less than 5° except

near faults where dips may exceed 5°. Faulting in this region has been described by Mears (1948, 1950), Twenter and Metzger (1963), Thompson (1968), and Levings (1980).

The northwestward-trending Verde fault zone (pl. 1) on the eastern side of the Black Hills consists of a main Verde fault and a series of parallel and subparallel subordinate faults, most of which lie to the east of the main fault. The faults dip steeply to the northeast, and the rocks on the northeast side are displaced downward. The zone is 2 mi wide near Jerome and 6 mi wide near Tule Mesa. The Verde fault exhibits the greatest vertical displacement of any fault in the study area. The throw is believed to be greater than 2,000 ft (Anderson and Creasey, 1958, p. 80). The Verde fault and the associated Bessie fault offset the Verde Formation and older formations.

Faults that displace Paleozoic rocks are from near Jerome to northeast of Perkinsville (pl. 1). The Orchard, Railroad, Haynes, and Warrior faults have the greatest displacement, which ranges from 150 to 800 feet, and are downthrown to the north or west. Additional information on these faults can be found in Anderson and Creasy (1958), Krieger (1965), and Lehner (1958).

Oak Creek, Sedona, Cathedral Rock, and Bear Wallow Canyon faults are the major faults in the Sedona area (pl. 1); all displace Paleozoic rocks. Oak Creek fault trends north-south and is downthrown 600 to 700 ft to the east (Twenter and Metzger, 1963, p. 64). The Sedona fault trends west-northwest and is downthrown 400 ft to the southwest (Twenter and Metzger, 1963, p. 64). Cathedral Rock fault trends northwest and is downthrown about 500 ft to the southwest (Twenter and Metzger, 1963, p. 65). Bear Wallow Canyon fault trends east-west and exhibits a maximum displacement of 170 ft downthrown to the south (Levings, 1980, p. 7). Additional faults that exhibit smaller displacements are found in the area, and volcanic flows probably cover even more faults. The rock units and overlying volcanic rocks, which are exposed in the canyons of Sycamore, Wet Beaver, and West Clear Creeks, contain many faults that do not offset the volcanic rocks. These faults trend northwest and exhibit variable displacements.

Fractures are common in the limestone and sandstone units that crop out in the area. Water travels along the fractures or faults, and enlarges fractures in the limestone by solution. Some solution channels are locally enlarged to caverns. The solution channels and caverns can store and transmit large quantities of ground water.

GROUND-WATER HYDROLOGY

For ease of discussion, the water-bearing rock units of the upper Verde River area are grouped into a regional aquifer. The aquifer comprises the alluvium along the Verde River, the Verde Formation, Coconino Sandstone, Supai Formation, Naco Formation, Redwall Limestone,

Martin Formation, and Tapeats Sandstone (pl. 1). The rock units are hydraulically connected; water flows from one unit into the next as it moves downgradient, and one potentiometric surface now is common to all (pl. 2). Well productivity and chemical quality of ground water differ from place to place because of the contrasting lithologies and secondary permeabilities of the rock units that make up the aquifer. Other aquifers discrete from the regional aquifer are the volcanic rocks, alluvium, granitic rocks, Kaibab Limestone, and Toroweap Formation.

Ground-water development in the Verde Valley is concentrated mainly along the Verde River and Oak Creek where the regional aquifer is the principal source of public and domestic water. Development of water resources in the Plateau uplands and Black Hills is sparse in comparison to that in the Verde Valley, and the water is used mainly for domestic and livestock supply. One exception is a well field near Lower Lake Mary (pl. 2), which is a public water supply for the city of Flagstaff (fig. 1).

Regional Aquifer

Units of the regional aquifer underlie all the upper Verde River area except where Precambrian rocks crop out west of the Verde fault from Chasm Creek to Jerome (pl. 1). Northeast of the Mogollon Rim, the regional aquifer consists of the Coconino Sandstone, Supai Formation, Naco Formation, Redwall Limestone, Martin Formation, and Tapeats Sandstone. In the Verde Valley the regional aquifer includes alluvium along the Verde River, the Verde Formation and the underlying basalt flows, Supai Formation, and Redwall Limestone. On the east side of the valley, the Verde Formation is underlain by the Supai Formation at a depth of 210 ft as shown in well (A-16-4)21aac. West of Cottonwood and east of the Verde fault, wells obtain water from the Redwall Limestone beneath the Verde Formation. No known well has completely penetrated the Verde Formation in the central and southern part of the valley. In the Black Hills, the regional aquifer consists of the Redwall, Martin, and Tapeats north of Jerome, and locally, the Martin and Tapeats south of Chasm Creek.

Occurrence of Ground Water

In most of the area, ground water in the regional aquifer is unconfined (water-table conditions). In places, water in the Verde Formation, Supai Formation, and Redwall Limestone is confined (artesian conditions). Near Rimrock, Cottonwood, Cornville, and Page Springs, the potentiometric surface is above the land surface and some wells flow. Measurements at two wells, one near Cottonwood and one near Cornville, show the water level to be about 0.1 and 47 ft above the land surface, respectively.

Northeast of the Mogollon Rim, the units that generally yield water to wells are the Coconino Sandstone and upper member of the Supai Formation. Well (A-18-7)27cbb near Munds Park is 1,500 ft deep and obtains water from the upper member of the Supai; the water level is 1,279 ft below the land surface (table 10). The Coconino is tapped by wells in Munds Park, near Upper and Lower Lake Mary, and in the southeast corner of the study area. Depth to water ranges from 275 to 791 ft below the land surface in wells that are from 400 to 1,480 ft deep (table 10).

The Supai Formation is the principal unit of the regional aquifer that provides water to wells near Sedona, Big Park, Oak Creek, Page Springs, and north of Rimrock. Most of the wells in the Sedona area tap the middle and lower members of the Supai. The upper member of the Supai is dry except along the downthrown side of Oak Creek fault and in the Red Rock area. Water is obtained from the sandstone beds of the Supai, and the depth to water in wells ranges from flowing at the land surface east of Rimrock and near Page Springs to 746 ft below the land surface near Grasshopper Flat. Well depths range from 90 to 3,203 ft; only one well is more than 1,405 ft deep (table 10). North of Bear Wallow Canyon fault and west of Grasshopper Flat in T. 18 N., R. 4 E., the Supai is above the regional water table and is drained except for locally perched zones in the sandstone beds. The water levels in perched zones are from 200 to 700 ft above the water level in the regional aquifer.

The Redwall Limestone yields water to wells west of Clarkdale and Cottonwood, near Sedona and Grasshopper Flat, north of Grasshopper Flat, and to a well southeast of Red Rock. Depth to water in wells ranges from flowing at the land surface to 733 ft below the land surface, and wells are from 225 to 822 ft deep (table 10). North of Bear Wallow Canyon fault and west of Grasshopper Flat, deep-well data indicate that the Redwall is above the regional water table and drained of water (Levings, 1980).

The Martin Formation yields water to wells in the Sedona-Red Rock area, near the town of Drake, and in the Black Hills south-southwest of Perkinsville (pl. 1). Depth to water in wells ranges from 145 to 917 ft below the land surface, and wells are from 200 to 1,215 ft deep (table 10). Wells generally obtain water from the Martin Formation or the Tapeats Sandstone, or both, north of Bear Wallow Canyon fault and west of Grasshopper Flat. The Tapeats Sandstone probably would yield water to wells in most of the area, but no wells are known to tap the unit.

The Verde Formation is the principal unit of the regional aquifer in the Verde Valley from north of Clarkdale to Cottonwood Basin (pl. 1). Depth to water in wells ranges from flowing at the land surface near Cornville and Rimrock to 489 ft below the land surface south of Cottonwood (table 10). Water is obtained mainly from the limestone and sandstone facies, although some water is obtained from the mudstone facies. Wells in the Verde Formation are from 30 to 1,625 ft deep (table 10).

In most places the alluvium along the Verde River between Clarkdale and Cottonwood Basin (pl. 1) is hydraulically connected to the Verde Formation and is part of the regional aquifer. Water levels are similar in altitude to those in wells that tap the Verde Formation near the Verde River, and water chemistry changes are the same. The alluvium generally is less than 50 ft thick, and water levels in wells are from 3 to 43 ft below the land surface; wells are from 28 to 110 ft deep (table 10). The deeper holes bottom in the Verde Formation, but the principal source of water is the alluvium.

Recharge, Movement, and Discharge of Ground Water

Ground water in the regional aquifer is derived from the infiltration of precipitation on permeable rock units and from surface water in streams and lakes. The main area of recharge is in the Plateau uplands part of the area where the greatest amount of precipitation occurs and where permeable sandstone, limestone, and fractured volcanic rocks crop out at the surface. A smaller amount of recharge occurs in the Central highlands part because the annual precipitation is less and the exposed rocks are less permeable than those exposed in the Plateau uplands. Along the eastern flank of the Black Hills, the rock units are highly faulted and fractured. Water infiltrates along the fractures in the Redwall Limestone, Martin Formation, and Tapeats Sandstone.

Underflow that crosses the study area boundary into the upper Verde River area is assumed to be negligible. Most of the boundaries of the study area approximate ground-water divides as implied by a few wells and the geology. Because data are scarce, the ground-water divides are not accurately known except along the eastern divide (pl. 2). A likely source of underflow is from Chino Valley (fig. 1). The only known rock units of the regional aquifer in Chino Valley exist as erosional remnants (Krieger, 1965); water occurs in the valley-fill deposits that contain interbedded volcanic rocks. Near Sullivan Lake where this ground water would flow into the upper Verde River area, only a thin section of regional aquifer is present to transmit underflow. About 4.5 mi downstream from the point at which the Verde River enters the study area, massive Precambrian granitic rocks crop out. The granitic rocks are nearly impermeable and probably do not transmit significant quantities of ground water. If significant quantities of ground water were moving into the area as underflow through the aquifer, the water probably would be discharged to the Verde River at the constriction caused by the granitic rocks. However, discharge measurements made in December 1979 when evapotranspiration would have been small show no measurable gain in streamflow in this reach. Any water moving through the granitic rocks would have to be moving along faults or fractures and be of a negligible quantity.

When the infiltrating water reaches the water table, it moves downgradient toward the Verde River. The altitude and configuration of the potentiometric surface are depicted by the contour lines on plate 2.

In the part of the Plateau uplands province within the study area, ground water moves southwestward from a ground-water divide toward the Mogollon Rim and into the Central highlands province. In the Central highlands province, the ground water flows toward the Verde River and then parallel to the river. Near Upper and Lower Lake Mary and in the southeast corner, part of the ground water flows to the northeast and out of the study area. Ground water probably moves down the eastern flank of the Black Hills toward the Verde River, but owing to the lack of data in this area the direction of the movement is poorly defined.

Ground water in the regional aquifer is discharged to springs, streams, and wells. Springs that issue from the Verde Formation near Rimrock discharge from 15 to about 1,280 gal/min; Page Springs discharge about 13,900 gal/min (table 11). Springs in the Coconino Sandstone maintain the perennial flow in parts of Wet Beaver Creek, West Clear Creek, and Oak Creek. The springs discharge from 75 to more than 1,000 gal/min (table 11). Along Oak Creek upstream from the town of Page Springs, part of the perennial flow is derived from the Supai Formation (Levings, 1980). Springs that issue from the Supai along the Verde River south of Sycamore Creek and at Mormon Pocket discharge about 50 to 75 gal/min (table 11). Along Dry Beaver Creek, springs discharge 85 gal/min from the Supai (table 11). Fossil Springs issue from the Naco Formation along the north wall of Fossil Canyon and furnish 18,600 gal/min to Fossil Creek (table 11). Downstream from the springs, a dam diverts the water into a flume that carries it to generate electricity in plants at Irving and Childs (pl. 3). Springs issue from the Redwall Limestone along the southern reach of Sycamore Creek and discharge 15 to 2,700 gal/min (table 11). Along the eastern flank of the Black Hills, the major source of springs is the Martin Formation. Near Jerome, springs are estimated to discharge from 2 to 52 gal/min; Brown Spring, just north of Tule Mesa, discharges about 50 gal/min (table 11). In the Black Hills, springs issue from the Tapeats Sandstone in sec. 11, T. 15 N., R. 2 E. One spring discharges about 40 gal/min (table 11).

Ground water, which is discharged to springs along the Verde River and its tributaries, maintains the base flow of the streams. Part of the water that has reached the surface is lost by evaporation from soils and open water surfaces and through transpiration by riparian vegetation, and part is diverted and used for irrigation. Some water diverted for irrigation may infiltrate back into the aquifer. The resultant base flow left in the Verde River leaves the area as surface water. Ground-water flow is intercepted by wells pumped for public and domestic use, mainly in the Verde Valley (pl. 2).

The seepage investigation showed no major gain south of Beasley Flat; therefore, little or no ground-water discharges to the river even where the Verde Formation pinches out onto volcanic rocks near Cottonwood Basin (pl. 3). About halfway between Cottonwood Basin and Childs, the river flows on an outcrop of nearly impermeable massive metamorphosed volcanic rocks of Precambrian age. About 130 ft of Martin Formation and Tapeats Sandstone lies between the impermeable rocks

and the Tertiary volcanic rocks (R. E. Lewis, California Institute of Technology, written commun., 1979). If underflow upgradient from this area were significant, part of it should discharge to the river upon reaching the constriction caused by the thinning of the aquifer. Concealed underflow would have to move along faults and fractures in the impermeable volcanic rocks. Because no significant gains in the base flow of the river were detected and because the quantity of underflow moving along faults or fractures would be small, underflow out of the area probably is negligible.

Vertical and lateral changes in lithology can act as impediments to the movement of ground water. Locally, mudstone and basalt flows interbedded in the Verde Formation confine ground water. Water moving through fractured volcanic rocks is confined by overlying ash or clay beds or perched by underlying ash or clay beds.

The Oak Creek fault (pl. 2) acts as an impediment to the lateral movement of ground water and as a conduit for flow. In the north half of Oak Creek Canyon, the less permeable upper member of the Supai Formation contacts the more permeable Coconino Sandstone and flow across the fault is impeded. Water flowing through the Coconino in a southwesterly direction cannot easily flow across the fault into the less permeable siltstone beds of the Supai. In this area, water moves along the fractured rock of the fault zone to discharge at springs along Oak Creek. A disruption in flow also occurs along the Bear Wallow Canyon fault (pl. 2).

Water-Yielding Characteristics of the Regional Aquifer

The water-yielding characteristics of the regional aquifer differ areally; fracturing and solution of the rock units locally increase the hydraulic conductivity of the aquifer.

Transmissivity.--The rate of downgradient movement of water from areas of inflow to areas of outflow and the potential rate of ground-water withdrawal are dependent on aquifer transmissivity. Values of transmissivity may be determined by aquifer tests or estimated by well tests, which consist of pumping a well at a constant rate and measuring the resultant decline and (or) recovery of the water levels in the pumped well and (or) observation wells. The test data are useful in determining the potential yield of wells and the effects of ground-water withdrawals.

Aquifer and well-test data show that transmissivity of the regional aquifer ranges from 20 to 16,000 ft^2/d (table 1). This wide range in transmissivity is a result of areal and vertical changes in lithology and the effect of secondary hydraulic conductivity caused by faulting, fracturing, and solution channels in the rock units. The higher transmissivity values are in faulted and fractured rock units of the regional aquifer.

Table 1.--Water-yielding characteristics for selected wells penetrating the regional aquifer in the upper Verde River area

Local well number	Well. diameter, in inches	Average discharge, in gallons per minute	Drawdown, in feet	Specific capacity, in gallons per minute per foot	Duration of aquifer test, in hours	Trans-missivity, in feet squared per day	Principal water-contributing rock units	Remarks
(A-14-05)17aac	10	45	33	1.3	24	880	Verde Formation	Twenter and Metzger, 1963; reported as (A-14-05)17aaa2; 80 feet of perforations.
(A-15-04)12abb	10	70	66	1.0	14	50	Verde Formation and Supai Formation	Levings, 1980; reported as (A-15-04)12abd; perforated intervals 661-702 feet, 881-941 feet.
(A-16-04)27dcc	6.63	37	209	0.2	47	20	Verde Formation	Levings, 1980; perforated intervals 60-80 feet, 240-260 feet, 358-388 feet.
(A-16-04)34abb	8	40	121	0.3	48	200	Verde Formation	U.S. Geological Survey files, 1977; 600 feet, total depth; 447 feet of open hole.
	6	470	42	11.3	15	14,100	Verde Formation	Arizona Water Commission (written commun., 1979); flowing well, 690 feet, total depth; 260 feet of perforations.
(A-17-05)19aaa	8	87	5	17.4	49	10,000	Supai Formation and Redwall Limestone	Levings, 1980; 622 feet of open hole.
(A-17-05)33ada1	8	708	43	16.5	29	16,000	Supai Formation and Redwall Limestone	Levings, 1980; well finish is unknown.
(A-20-08)18bcc	20	600	431	1.4	5,400	1,070	Coconino Sandstone and Supai Formation	Harshbarger and Associates, 1976; 521 feet of perforations; data from aquifer test on well field.
(A-20-08)19aba	20	701	342	2.0	5,400	800	Coconino Sandstone and Supai Formation	Harshbarger and Associates, 1976; 480 feet of perforations, 45 feet of open hole; data from aquifer test on well field.
(A-20-08)20dbc	20	1,000	182	5.5	98	800	Coconino Sandstone and Supai Formation	Harshbarger and Associates, 1976; 675 feet of perforations.

Specific capacity is roughly proportional to the transmissivity but differs from well to well because of the differences in well construction and development. Most of the data available to calculate specific capacities are from short-term tests, which may differ from those calculated on the basis of longer term pumping at a constant rate. The specific capacity of most wells producing from the regional aquifer ranged from 0.1 to 118.0 (gal/min)/ft (table 1).

Well yields.--Well yields are a function of the lithology and fracturing of the geologic units, thickness of the aquifer penetrated, well construction and development, and aquifer transmissivity. Well-yield data were obtained from drillers' reports, normal pumping operations, and well-test data. Well yields ranged from less than 10 to 1,600 gal/min, but these values may not represent the maximum yields obtainable.

Wells that obtain water from the Paleozoic rock units (pl. 1) show a wide range in yields (table 2) owing to the different lithologies of the units and secondary features, which increase the hydraulic conductivity. The higher yields in the Coconino Sandstone and Supai Formation occur in areas of fracturing and faulting. Near Rimrock and Page Springs, flowing wells that tap the Supai yield from 2 to 70 gal/min. In addition to fracturing and faulting, solution cavities along fractures improve the yields from the Redwall Limestone and Martin Formation.

Wells that produce from the Verde Formation are generally similar in size and construction characteristics. The yields (table 2) differ mainly owing to areal and vertical changes in lithology of the rock units making up the formation and the lenticular nature of the deposits. Higher yields occur where the limestone facies contain solution channels and joints.

Table 2.--Well-yield data for rock units in the regional aquifer

Rock unit	Number of wells	Well yields, in gallons per minute		
		Minimum	Maximum	Median
Alluvium[1]	18	12	300	32
Verde Formation	138	2	1,600	30
Coconino Sandstone	14	10	1,000	150
Supai Formation	74	1	225	25
Redwall Limestone	13	0.4	1,078	92
Martin Formation	2	10	10	10

[1]Along the channel and flood plain of the Verde River.

Wells that produce from the alluvium along the channel and flood plain of the Verde River generally yield less than 50 gal/min (table 2). The hydraulic conductivity of the alluvium depends on the amount of fine-grained matrix present in the sand, gravel, and boulders. The saturated thickness of the alluvium generally is less than 20 ft, and in some places the alluvium is dry.

Chemical Quality of Ground Water

Ground water in the regional aquifer generally is suitable for most uses. Water obtained from the Verde Formation and alluvium near Camp Verde, however, may exceed the drinking-water standards for dissolved solids, sulfate, and some minor elements. The maximum contaminant level for dissolved solids in public water supplies is 500 mg/L (milligrams per liter), as proposed in the secondary drinking-water regulations of the U.S. Environmental Protection Agency (1977b, p. 17146). Water that contains a larger dissolved-solids concentration is used when better water is not available. The chemical composition and quality differ areally depending on which rock unit is tapped (table 3). The major ions in the water obtained from the Coconino Sandstone, Supai Formation, Redwall Limestone, and Martin Formation are calcium, magnesium, and bicarbonate. Dissolved-solids concentrations range from 134 to 1,480 mg/L. Four samples out of 158 exceeded the maximum contaminant level of 500 mg/L (table 13). Three of these samples were from storage tanks at the wells, and the dissolved-solids concentrations are 503, 506, and 585 mg/L. The first two wells probably tap the Supai and Redwall, and the latter one taps the Supai, Redwall, and Martin. Water from the fourth well, (A-17-6)6dca, had a dissolved-solids concentration of 1,480 mg/L before the well was plugged back. This well was originally drilled to Precambrian granite and tapped the Supai, Redwall, and Martin. After plugging, the well was perforated only in the Supai, and a specific-conductance measurement showed a marked decrease in dissolved solids. In general, the Redwall and Martin yield water with a larger dissolved-solids concentration than the overlying Supai or Coconino.

The most noticeable changes in composition and quality of the ground water occur in the Verde Formation. The chemical composition of water changes as it flows from the northern sections of the Verde Valley toward the southern outflow point (table 4). The major ions in the ground water in the areas of Cottonwood, Cornville, and Lake Montezuma are calcium, magnesium, sodium, and bicarbonate. Near Middle Verde, the major ions are calcium, magnesium, sodium, sulfate, and bicarbonate. At Camp Verde, the major ions are calcium, magnesium, sodium, chloride, sulfate, and bicarbonate. The major ions in water from three wells southeast of Camp Verde are sodium, magnesium, and sulfate. The dissolved solids increase from north to south in the Verde Valley; only 8 percent of the samples exceed the 500 mg/L limit at Cottonwood, whereas 96 percent exceed the limit at and southeast of Camp Verde. The composition changes are due mainly to the rock type through which the water flows.

Table 3.--Summary of quality of water in rock units in the regional aquifer

[Analytical results in milligrams per liter except as indicated. All samples may not contain values for all parameters]

Constituent	Alluvium along the Verde River (7 samples)	Verde Formation (188 samples)	Coconino Sandstone (15 samples)	Supai Formation (112 samples)	Redwall Limestone (24 samples)	Martin Formation (7 samples)
Calcium						
Minimum	43	21	23	17	25	44
Maximum	150	560	73	95	100	320
Median	63	68	43	48	72	58
Magnesium						
Minimum	32	8.6	10	7.7	11	17
Maximum	210	4,450	52	90	58	170
Median	83	34	22	21	24	40
Sodium[1]						
Minimum	30	8.7	2.0	2.0	0	6.0
Maximum	980	24,300	18	29	58	38
Median	150	34	5.1	8.5	9.0	20
Bicarbonate						
Minimum	290	52	147	100	151	210
Maximum	590	980	450	532	439	1,840
Median	559	350	240	258	310	330
Sulfate						
Minimum	47	<1.0	0.2	<1	<1.0	5.4
Maximum	1,900	64,700	5.4	81	100	37
Median	220	14	2.8	6.0	7.4	30
Chloride						
Minimum	17	4.5	1.1	1.0	2.0	3.4
Maximum	360	3,530	7.0	90	114	43
Median	66	27	4.0	6.0	8	22
Fluoride						
Minimum	0.3	0	0	0	<0.1	0.1
Maximum	0.8	3.4	0.4	0.6	0.6	0.4
Median	0.7	0.3	0.1	0.1	0.2	0.2
Dissolved solids						
Minimum	383	209	135	134	158	207
Maximum	3,790	97,700	360	585	503	1,480
Median	1,450	424	211	242	307	420
Arsenic, in micrograms per liter						
Minimum	11	1	3	<5	<5	6
Maximum	30	240	6	30	<10	6
Median	27	30	4	<10	<10	6

[1]Includes sodium plus potassium values.

Table 4.--Summary of quality of water in the Verde Formation

[Analytical results in milligrams per liter except as indicated. All samples may not contain values for all parameters]

Constituent	Cottonwood and Clarkdale (38 samples)	Cornville and Page Springs (52 samples)	Lake Montezuma and Rimrock (43 samples)	Middle Verde (29 samples)	Camp Verde (21 samples)	Southeast of Camp Verde (5 samples)
Calcium						
Minimum.........	21	30	32	32	28	69
Maximum	212	170	148	185	150	560
Median	52	64	80	59	78	125
Magnesium						
Minimum.........	12	8.6	18	20	12	35
Maximum	98	69	55	401	280	4,450
Median	29	30	32	48	53	100
Sodium[1]						
Minimum.........	9.0	8.7	13	20	40	9.4
Maximum	74	110	116	1,100	300	24,300
Median	20	36	40	27	88	38
Bicarbonate						
Minimum.........	208	52	290	260	316	226
Maximum	530	980	775	410	540	336
Median	297	380	441	330	450	320
Sulfate						
Minimum.........	<1.0	3.0	1.0	9.5	69	78
Maximum	673	84	18	2,900	1,200	64,700
Median	8.0	14	12	64	210	485
Percentage of samples greater than 250 mg/L[2].....	3	0	36	36	67	75
Chloride						
Minimum.........	4.5	8.0	9.7	15	20	4.9
Maximum	52	83	49	260	200	3,530
Median	22	16	28	22	47	29
Percentage of samples greater than 250 mg/L[2].....	0	0	36	9	0	25
Fluoride						
Minimum.........	0.1	0	0	0.2	0.4	0.2
Maximum	0.6	1.9	0.6	3.4	2.9	0.5
Median	0.2	0.3	0.3	0.8	1.0	0.4
Dissolved solids						
Minimum.........	210	209	283	321	513	378
Maximum	1,260	987	730	4,810	2,080	97,700
Median	312	388	452	416	831	986
Percentage of samples greater than 500 mg/L[2].....	8	30	44	41	100	75
Arsenic, in micrograms per liter						
Minimum.........	3	1	1	14	9	3
Maximum	30	92	130	240	120	62
Median	14	27	36	46	43	14
Percentage of samples greater than 50 µg/L[2]......	0	19	21	43	44	25

[1]Includes sodium plus potassium values.
[2]Maximum contaminent levels as set by U.S. Environmental Protection Agency (1977b, c) and Bureau of Water Quality Control (1978).

The alluvium along the channel and flood plain of the Verde River contains water that differs in composition depending on location. Data for five wells indicate a hydraulic connection between the alluvium and the Verde Formation. A well that taps alluvium south of Middle Verde yields water that contains dissolved solids of 383 mg/L, mainly magnesium, calcium, sodium, and bicarbonate. Southeast of Camp Verde, similar wells produce water with dissolved solids that range from 806 to 3,790 mg/L (table 13), mainly magnesium, sodium, calcium, and sulfate. The similarities in chemical composition and correlation of areas with large concentrations of dissolved solids in the alluvium and Verde Formation indicate a hydraulic connection. The water in the Verde Formation, which contains large concentrations of dissolved solids flows into the alluvium, and increases the dissolved-solids concentration in the water in the alluvium. Increasing sodium and sulfate correlate with increasing dissolved solids for water from the Verde Formation and alluvium (table 3).

The U.S. Environmental Protection Agency (1977a, b) has established national regulations and guidelines for the quality of water provided by public water systems. Primary drinking-water regulations govern contaminants in drinking water that have been shown to affect human health, such as fluoride and arsenic. Secondary drinking-water regulations apply to those contaminants that affect esthetic quality, such as dissolved solids, sodium, magnesium, sulfate, and chloride. The primary regulations are enforceable either by the Environmental Protection Agency or by the States; in contrast, the secondary regulations are not Federally enforceable but are intended as guidelines for the States.

In some wells in Middle Verde and Camp Verde, sulfate exceeds the maximum contaminant level of 250 mg/L (U.S. Environmental Protection Agency, 1977b, p. 17146). Large concentrations of sulfate occur in wells that obtain water from the Verde Formation and alluvium (table 3). Large concentrations of sulfate in the water are associated with solution of evaporite minerals in the Verde Formation. These evaporite minerals are mainly sodium sulfate salts and minor amounts of sodium chloride and gypsum (hydrous calcium sulfate), which are present in sufficient quantity to make mining economical. An active gypsum mine is in sec. 11, T. 13 N., R. 5 E., and an inactive salt mine is in sec. 1, T. 13 N., R. 4 E. (pl. 1).

Chloride occurs in water from the Verde Formation and alluvium (table 3). Two wells in the Verde Formation yield water in which the chloride concentration exceeds the maximum contaminant level of 250 mg/L (U.S. Environmental Protection Agency, 1977b, p. 17146). One well just south of Middle Verde yields water that contains a chloride concentration of 260 mg/L. The other well is the same well that contains anomalously large concentrations of dissolved solids, and the chloride concentration is 3,530 mg/L (table 13). Water from two wells in the alluvium in Camp Verde contains 290 and 360 mg/L of chloride, which exceeds the maximum contaminant level.

Selenium, iron, manganese, mercury, fluoride, and arsenic in drinking water and boron in irrigation water exceed the maximum contaminant level set by the U.S. Environmental Protection Agency (1977c) and the State of Arizona (Bureau of Water Quality Control, 1978). For all these constituents except fluoride and arsenic, the large concentrations occur at individual sites scattered throughout the area. Maximum contaminant levels for selected chemical constituents are given below. The maximum contaminant levels for metals and trace elements are given in total concentrations.

Constituent	Concentration
Iron (Fe)	300 µg/L
Arsenic (As)	50 µg/L
Manganese (Mn)	50 µg/L
Selenium (Se)	10 µg/L
Mercury (Hg)	2 µg/L

The maximum contaminant level for boron is 750 µg/L (micrograms per liter) and is applicable to water used for long-term irrigation on sensitive crops (U.S. Environmental Protection Agency, 1977c).

Fluoride concentrations exceed the maximum contaminant level in some wells that derive their water from the Verde Formation (table 4). The maximum contaminant level for fluoride in public water supplies differs according to the annual average maximum daily air temperature (Bureau of Water Quality Control, 1978, p. 6). The amount of water consumed by humans, and therefore the amount of fluoride ingested, depends partly on air temperature. Listed below are the maximum contaminant levels for fluoride in drinking water for the indicated temperatures at weather stations in the upper Verde River area (Sellers and Hill, 1974).

Station	Altitude above National Geodetic Vertical Datum of 1929, in feet	Average maximum daily air temperature, in degrees Farenheit	Maximum contaminant level for fluoride, in milligrams per liter
Beaver Creek Ranger Station	3,820	76.6	1.6
Cottonwood	3,360	78.4	1.6
Flagstaff Airport	7,006	60.8	2.0
Jerome	5,245	69.2	1.8
Junipine	5,124	69.9	1.8
Montezuma Castle	3,180	80.2	1.4
Perkinsville	3,855	75.7	1.6
Sedona Ranger Station	4,320	74.7	1.6

In the study area, the average maximum daily air temperature is related directly to altitude. The lowest maximum contaminant level for fluoride, 1.4 mg/L, occurs at the lower altitudes in the southern part of the Verde Valley from Middle Verde southward. North of Middle Verde in the valley, the maximum contaminant level is 1.6 mg/L. The highest maximum contaminant level, 2.0 mg/L, occurs at the higher altitudes on the plateau. The water from six wells near Camp Verde and three wells near Middle Verde exceeded the maximum contaminant level for fluoride, which is 1.4 mg/L for this area.

Arsenic is found in water from the regional aquifer. In most of the study area, arsenic concentrations are less than 10 μg/L except at Big Park and in the Verde Valley. At Big Park (pl. 1), concentrations in water from the Supai Formation range from 20 to 30 μg/L. In the Verde Valley, concentrations in water from the Verde Formation are as much as 240 μg/L. South of Camp Verde, concentrations in water from the alluvium range from 11 to 30 μg/L. Arsenic concentrations that exceed the maximum contaminant level of 50 μg/L (U.S. Environmental Protection Agency, 1977c) are found only in ground water obtained from the Verde Formation (table 3). Water from some wells near Cornville, Rimrock, Lake Montezuma, Middle Verde, and Camp Verde (fig. 3) (table 4) contain more than 50 μg/L of arsenic. Arsenic concentrations range from 1 to 240 μg/L in 125 samples of water from the Verde Formation (table 13). In the southern half of the Verde Valley where large concentrations of arsenic occur, 31 percent of the 97 samples exceed the maximum contaminant level for arsenic.

Arsenic concentrations in water from the Verde Formation are shown in figure 3 and include total and dissolved concentrations. The maximum contaminant levels used by the Arizona Bureau of Water Quality Control are total concentrations. Water samples analyzed by the Arizona Department of Health Services give total trace-element concentrations, but those in this area analyzed by the U.S. Geological Survey laboratory prior to 1979 report dissolved concentrations. To compare the two methods of reporting concentrations, some water samples were analyzed for both total and dissolved arsenic. For most wells, the total and dissolved concentrations were equal, within the detection limits of the analysis. A difference between total and dissolved concentrations indicates suspended arsenic, which was found in some samples.

The wells that contained suspended arsenic were compared because the suspended form is uncommon in ground water. Similar conditions existed at each of the wells. All the sampled wells that contain suspended arsenic are under artesian conditions, and those with the highest suspended values flow at the land surface. In most of these wells the water rises 200 ft or more above the depth where water was encountered during drilling. The artesian conditions can maintain vertical circulation in the wells and keep the clay particles in suspension, which increases the total arsenic concentration of a water sample. The largest number of water samples with suspended arsenic concentrations were from wells near Lake Montezuma where the red clay contains the largest arsenic concentrations of all the rock units sampled.

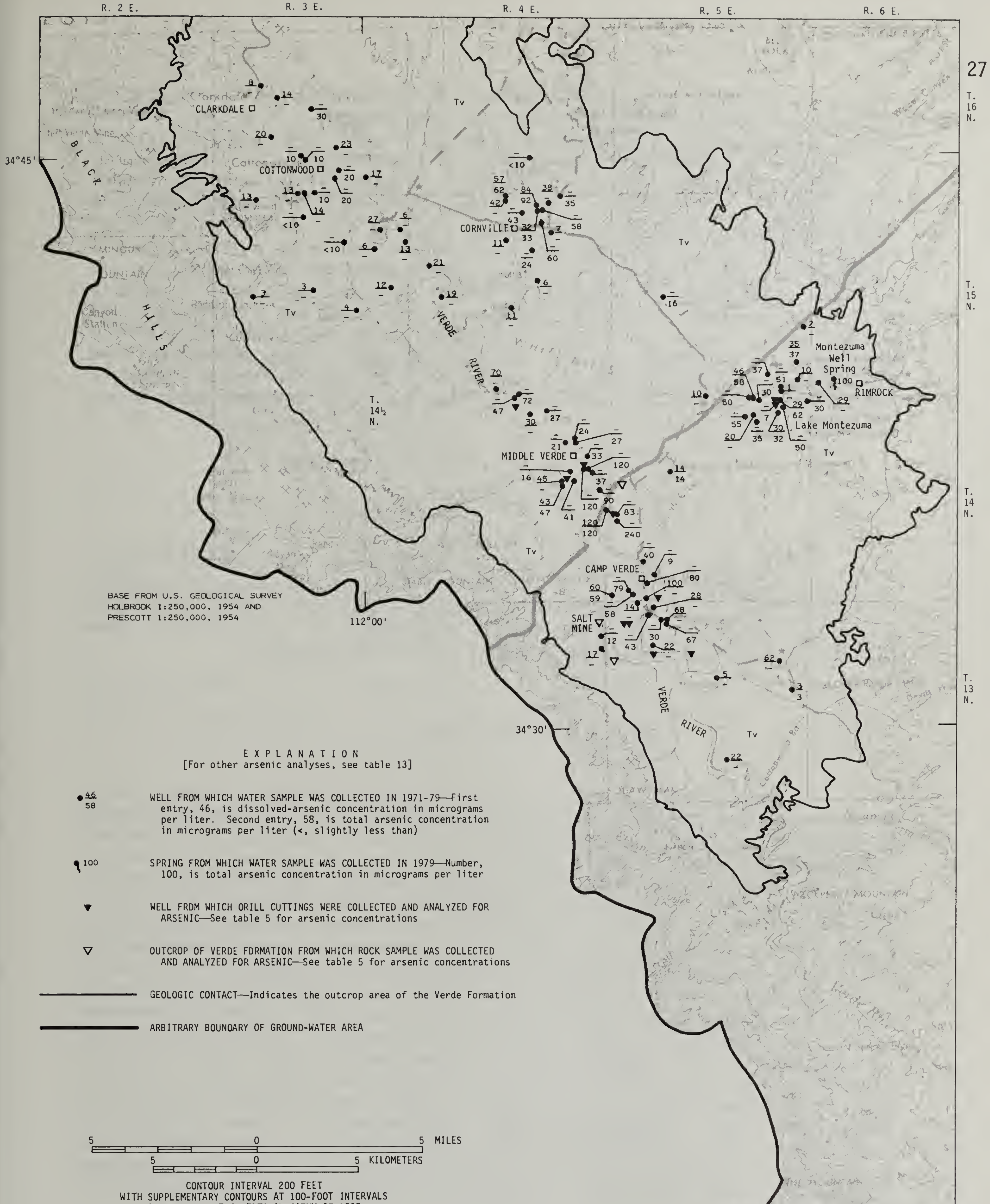


Figure 3.--Arsenic concentrations in water from selected wells in the Verde Formation.

Arsenic occurs in the rocks of the Verde Formation. Drill cuttings and outcrop samples from the Verde Formation (fig. 3) contained from 7 to 88 μg/g (micrograms per gram) of arsenic (table 5) and indicate that arsenic is disseminated throughout the formation rather than occurring in a particular bed of the formation. The amount of arsenic present in different beds does differ with location. A sample of the salt deposits from the Camp Verde Salt Mine contained the least amount of arsenic, 7 μg/g. The white lime beds contained from 7 to 43 μg/g of arsenic and averaged 19 μg/g. The blue clay beds contained from 16 to 73 μg/g, and the blue lime beds contained from 24 to 75 μg/g; both units averaged 54 μg/g of arsenic. The largest concentrations of arsenic were contained in the red clay beds near Lake Montezuma where the values were 34 and 88 μg/g and averaged 61 μg/g. Arsenic probably is associated with clay where arsenic ions are in the matrix of the clay particles. Arsenic concentrations are lowest in the clean white limestone and salt beds where the clay content is low.

Other Aquifers

In places, ground water is present in the volcanic rocks, alluvium, granitic rocks, Kaibab Limestone, and Toroweap Formation. Although these units do not contain ground water over large areas, they do provide locally important sources of water where developing water from the underlying formations means deeper wells at added cost.

Volcanic Rocks

Several wells and springs obtain water from the volcanic rocks northeast of the Mogollon Rim and in the Black Hills. The ground water is contained in fractured basalt flows and cinder beds several hundred feet above the regional water table and generally is perched over underlying rocks of low hydraulic conductivity. Locally, the underlying rocks may include the siltstone and mudstone in the Moenkopi Formation, unfractured basalt flows, or clay and ash layers between two basalt flows. These nearly impermeable rocks retard the downward movement of water into underlying formations; where they are absent, the volcanic rocks are dry. Wells are from 40 to 800 ft deep, and water levels range from 2 to 752 ft below the land surface (table 10). Wells in volcanic rocks are reported to yield from 0.8 to 80 gal/min. Well (A-18-7)27cba penetrates 400 ft of volcanic rocks and the yield is reported to fluctuate seasonally. In sec. 10, T. 21 N., R. 2 E., and sec. 27, T. 18 N., R. 9 E., shallow wells—less than 130 ft deep—that penetrate the volcanic rocks are dry. Springs generally discharge less than 20 gal/min (table 11). Verde Hot Springs is in the extreme southern part of the area along the Verde River in a fault zone and discharges an estimated 10 gal/min. The temperature of water that issues from the basalt at this location is 39°C.

Table 5.--Arsenic concentrations in selected drill cuttings and outcrop samples from the Verde Formation

Local number	Drillers' description of the rock samples[1]	Depth interval, in feet below land surface	Arsenic concentration, in micrograms per gram
(A-13-04)01dac	Salt	Outcrop	7
(A-13-05)06dbc	Blue clay	19- 48	16
	Blue lime	85-140	66
(A-13-05)06dbd	White lime	15- 21	24
	Green lime	21- 40	48
	Blue lime	40- 48	64
(A-13-05)07cca	Blue clay	Outcrop	38
(A-13-05)08caa1	Blue clay	24- 37	67
(A-13-05)09dbb	Brown clay	23- 77	28
	Blue clay	77-160	73
	Blue lime	160-210	75
(A-14-04)03bbc	White lime	57-120	9
(A-14-04)13bca2	Blue clay	20- 30	56
	Blue lime	40- 50	47
	Blue lime	90-100	43
(A-14-04)14dba	Blue clay	40-105	73
	Blue lime	105-220	24
(A-14-05)02aad	White lime	158-210	43
	Red clay	270-286	34
(A-14-05)02ada	Red clay	75-115, 141-160	88
(A-14-05)18cba	Blue clay	Outcrop	54
(A-14-05)19bcc	Blue lime	42-150	58
	White lime	150-250	10
(A-14-05)32dcc	White lime	90-108	7
	Gray lime	123-130	20

[1]Drillers' logs for these wells appear in table 15.

The ground water in the volcanic rocks, with the exception of Verde Hot Springs, is generally of acceptable chemical quality according to the standards set for drinking water. Water samples from five wells and nine springs (table 13) indicate that the dominant ions in solution are calcium, magnesium, sodium, and bicarbonate. The dissolved solids range from 111 to 600 mg/L. Table Mountain Spring, (A-12-5)10a, is near the southern extent of the Verde Formation depositional area and issues at the contact of fractured basalt and a red tuff. The water contains 600 mg/L of dissolved solids, a larger concentration of sulfate than other springs that drain volcanic rocks, and 9 μg/L of mercury. This sample is the only one that exceeds the maximum contaminant level for mercury. Arsenic analyses are available for two wells in the Black Hills, (A-13-6)29dbb and (A-16-2)24aab, that obtain water from volcanic rocks. Both contained arsenic, 14 and 50 μg/L, respectively, and the latter amount was at the limit recommended in the standards.

Verde Hot Springs, (A-11-6)11a, contains larger concentrations of the major ions than other springs issuing from the volcanic rocks (table 13). The dissolved-solids concentration is 3,230 mg/L, mainly sodium and bicarbonate. Other constituents with large concentrations are arsenic, iron, and boron, which are 1,400, 870, and 9,100 μg/L, respectively.

Alluvium

Local deposits of alluvium near Munds Park, Cherry, Mormon Lake, Bill Williams Mountain, and along Hackberry Creek and Oak Creek in secs. 7 and 19, T. 17 N., R. 6 E., yield water to wells and springs. The water supplies are perched above the regional aquifer and water levels may be influenced by the stage of nearby streams. In Munds Park, wells are from 19 to 388 ft deep, yield from 5 to 450 gal/min, and the depth to water ranges from 8 to 170 ft below the land surface (table 10). Near Cherry, the depth to water is from 15 to 35 ft below the land surface, and wells are 50 to 150 ft deep. Two springs discharge water from alluvium; (A-21-3)27bad discharges 0.7 gal/min, and (A-12-6)11d, which is along Hackberry Creek, discharges 2 gal/min but is reported to fluctuate seasonally (table 11). Three wells in T. 17 N., R. 6 E., obtain water from the alluvium along Oak Creek. Wells are from 18 to 25 ft deep, and depth to water ranges from 13 to 16 ft below the land surface. Water is perched by the underlying siltstone beds of the Supai Formation.

The major ions present in water from the alluvium are calcium and bicarbonate. Water-quality data are available for four wells in Munds Park (table 13). The dissolved-solids concentrations range from 134 to 388 mg/L and averaged 222 mg/L. Water from spring (A-12-6)11d, which issues from the alluvium along Hackberry Creek, had a dissolved-solids concentration of 311 mg/L and is similar in chemical makeup to the waters in the volcanic rocks (table 13).

Granitic Rocks

In the Black Hills a few wells and springs obtain water from fractured granitic rocks. Two wells that obtain water from granite are 60 and 111 ft deep, and depth to water is 12 and 68 ft below the land surface, respectively (table 10).

Water from one well and three springs contained from 325 to 390 mg/L of dissolved solids, mainly calcium and bicarbonate (table 13). A fourth spring, (A-13-5)29cca, contained 669 mg/L of dissolved solids, mainly calcium and bicarbonate, and contained higher percentages of magnesium and sulfate than the other samples. This spring issues from an abandoned mine shaft, and the water quality may be influenced by the mine workings.

Kaibab Limestone and Toroweap Formation

The Kaibab Limestone and Toroweap Formation are above the regional water table, and no wells are known to obtain water from these rocks. Several springs along tributaries to Oak Creek, along the northern reach of Sycamore Canyon, near Upper Lake Mary, and in the southeastern part of the study area, issue from these rocks. Ground water contained in the sandstone of the Toroweap or in fractures, solution fissures, and solution caverns in the limestone of the Kaibab is perched on underlying siltstone and mudstone in the Toroweap or on chert beds in the Kaibab. Discharges from these springs range from 0.12 to 20 gal/min (table 11). Water-quality data are not available for the springs that issue from the Toroweap Formation or Kaibab Limestone.

SURFACE-WATER HYDROLOGY

The upper Verde River area, in contrast to much of Arizona, has several perennial streams: Verde River, Sycamore Creek, Bitter Creek, Oak Creek, Wet Beaver Creek, West Clear Creek, and Fossil Creek (fig. 1). All these streams except Bitter Creek provide water of acceptable quality for irrigation, recreation, warm- and cold-water fisheries and wildlife habitat. Manmade lakes in the area include Upper and Lower Lake Mary, White Horse Lake, and Stehr Lake. Mormon Lake and Stoneman Lake are in natural closed basins. Pecks Lake is a cutoff meander of the Verde River and is fed by a manmade surface diversion from the Verde River (pl. 2). Upper Lake Mary provides a large proportion of the municipal water supply for the city of Flagstaff. The primary uses of most other lakes are associated with recreation, fisheries, wildlife habitat, and livestock watering.

The delineation of the study-area boundary is not coincident with the drainage area boundary of the Verde River. Parts of the upper

Verde River area, which total about 160 mi^2, are drained by the Little Colorado River (fig. 1). Small drainages, which are along the southeastern boundary of the study area and total about 17 mi^2, are drained by the East Verde River, which joins the Verde River downstream from the study area. The uppermost parts of the Sycamore Creek and Oak Creek drainages are outside the study-area boundary, as is the southeast part of the Fossil Creek drainage owing to Fossil Creek being part of the south boundary.

Streamflow is composed of two components—direct runoff and base flow. Direct runoff has little effect on the amount of water available for use in the upper Verde River area. Storm runoff occurs over short periods of time, and snowmelt occurs when there is little need for irrigation water. No major surface-water impoundments are present for the storage of high flows or regulation of the flow of the upper Verde River or its tributaries. Conversely, base flow is an extremely important source of water. In some reaches base flow increases downstream because of ground-water discharge; in other reaches the base flow is depleted by evaporation, transpiration by riparian vegetation, and diversions for irrigation. About 30 irrigation diversions, which draw water directly from the streams by means of low diversion dams and pumps, provide water to 7,781 acres (Northern Arizona Council of Governments, 1979, p. 123) and have a pronounced effect on the low-flow characteristics of some stream reaches. Most primary diversions are operated by groups of landowners. Near Cottonwood and Camp Verde, the irrigation canals often carry more than half the flow of the Verde River, and all the flow in West Clear Creek is often diverted near the mouth. The availability of streamflow, therefore, is limited by natural low flows and upstream usage. Because of its importance, base flow is emphasized more than direct runoff in the following analyses of streamflow.

Base Flow and Ground-Water Seepage

The base-flow characteristics of the Verde River and its major tributaries are a function of precipitation and the properties of the regional aquifer. The capacity of the aquifer to absorb, store, and transmit water has a significant effect on base flow, as does the relative distance of the streams from the aquifer recharge area. Long-term changes in the base flow may indicate changes in the volume of water stored in the aquifer and how discharge from the aquifer is distributed among pumpage, streamflow, and evapotranspiration losses, which are dependent on rainfall and land use.

The ground-water hydrology section of the report describes a large regional aquifer with a recharge area distant from the Verde River. Recharge to the aquifer is large and changes little with time. Base flow of the streams that drain the regional aquifer therefore varies little with precipitation or from year to year.

The base flow in the Verde River and most tributaries varies seasonally in relation to the amount of water used by plants. Base flow is at a maximum in January and February and at a minimum in July and August. The year-to-year variation in base flow that enters the Verde Valley by way of the Verde River and tributaries is small. A comparison of 1976-79 data with 1935-45 data showed variations in the quantity of summer base flow leaving the Verde Valley, which may indicate an increase in use of water along the streams in the valley rather than being a result of pumpage from the regional aquifer. Pumping from the regional aquifer probably would also decrease the winter base flow as well as the summer base flow.

Base flow at each gaging station was determined by visual separation of daily discharge hydrographs into the direct-runoff component and the base-flow component. This method is suitable to the study area because direct runoff from storms generally is of short duration, and streams generally return to base flow within two weeks after a rainfall peak and within two months after a snowmelt peak, but these long periods of melt are infrequent. Neither storm runoff nor snowmelt cause much increase in the base flow.

When base-flow hydrographs for individual years are superimposed, all the hydrographs fall in a narrow band indicated by the upper and lower hydrographs of figures 4 and 5. The spacing between the limiting hydrographs may represent either a true variation in base flow, a variation in computational procedure, or a combination of both. The variations are not chronological and cannot be related to climatic factors of wet or dry years. A hydrograph that follows the center of the band represents the median values and provides the best estimate of base flow for any date. Hydrographs of median values of base flow are shown in figures 4 and 5. Base flow is at a maximum in January and February when plants are dormant and evaporation is low. The high base flow in January represents the average ground-water discharge from the regional aquifer. The seasonal variation in base flow is an indication of evapotranspiration losses in the drainage area upstream from a gaging station, but losses due to riparian vegetation and evaporation from free water surfaces cannot be isolated from other losses if a large quantity of water is diverted.

To determine the areal distribution and magnitude of ground-water inflow to the Verde River between Clarkdale and Fossil Creek, discharge measurements were made at 55 sites during a period of base flow in June 1979. The difference in flow rates between successive measurement sites along the study reach—after adjustment for surface inflow and outflow in tributaries, diversions and returns—can be attributed to gains from or losses to the regional aquifer. In some places the gains occur over a long reach of the stream; however, in other places the gains are localized at springs.

Two previous seepage investigations were run during July 1963 and June 1977. During July 1963, 12 sites were measured on the Verde River from Sullivan Lake (fig. 1) to Chasm Creek (pl. 2), and 38 sites

were measured along tributary streams and irrigation diversions but did not include any return flow. During June 1977, 10 sites on the Verde River from Paulden to Chasm Creek and 9 sites along Oak and Beaver Creeks were measured. This investigation did not include any of the other tributaries or the irrigation diversions and returns.

Verde River

Perennial flow in the Verde River begins near Granite Creek 1.2 mi upstream from the study-area boundary (fig. 1). Discharge measurements made in 1977 show that the Verde River gained 20.4 ft^3/s between Granite Creek and Stewart Ranch (pl. 3), which is located just inside the study area (U.S. Geological Survey, 1978, p. 507-508). Between Stewart Ranch and the Verde River near Paulden gage, discharge measurements indicated a gain of 6.7 ft^3/s. Base flow at the Paulden gage is virtually constant and ranges from 20 to 26 ft^3/s (fig. 4A). The seasonal variation in the median base-flow hydrograph is from 22 to 24 ft^3/s. Between the gage near Paulden and the gage near Clarkdale, base flow increases. Base flow at Verde River near Clarkdale ranges from 60 to 93 ft^3/s, and the seasonal variation in median base flow is from 68 to 83 ft^3/s (fig. 4B). Discharge measurements made in 1977 and 1979 (U.S. Geological Survey, 1978; 1980b) show a gain in flow attributed to ground water of about 22 ft^3/s at Mormon Pocket, 9 ft^3/s from below Mormon Pocket to Sycamore Creek, and 12 ft^3/s downstream from Sycamore Creek (pl. 2). No ground water discharges to the Verde River in the 2 mi reach below the Paulden gage but about 2 ft^3/s discharges between there and Mormon Pocket. Tributary inflow from Sycamore Creek is 9 ft^3/s. The loss in streamflow indicated near French Ranch is probably associated with a small deposit of alluvium and an irrigation diversion.

The gaging station, Verde River near Camp Verde, is located just above Chasm Creek and 9 mi southeast of Camp Verde. Base flow leaving the study area is monitored at this station. Base flow ranges from 180 to 240 ft^3/s during January and from 43 to 96 ft^3/s during July. The seasonal variation of the median base flow is from 66 to 200 ft^3/s. The average winter base flow is 200 ft^3/s, which does not agree with the value calculated by Twenter and Metzger (1963) of 225 ft^3/s; the discrepancy is attributed to the differences in interpretation methods. All the data from the previous period of record from 1935-45 and the current 1976-79 record were used to calculate base-flow hydrographs.

Seasonal variations differ at the three Verde River gaging stations. The large seasonal variation at the Verde River near Camp Verde gage is a result of about 45 ft^3/s of evapotranspiration losses along the Verde River and its tributaries between Clarkdale and the gage (Anderson, 1976) and large water use for irrigation. The small seasonal variation at the Paulden and Clarkdale gages is associated with the low water use in this region and low loss of water to evapotranspiration. The water lost to evapotranspiration between Sullivan Lake and Clarkdale is

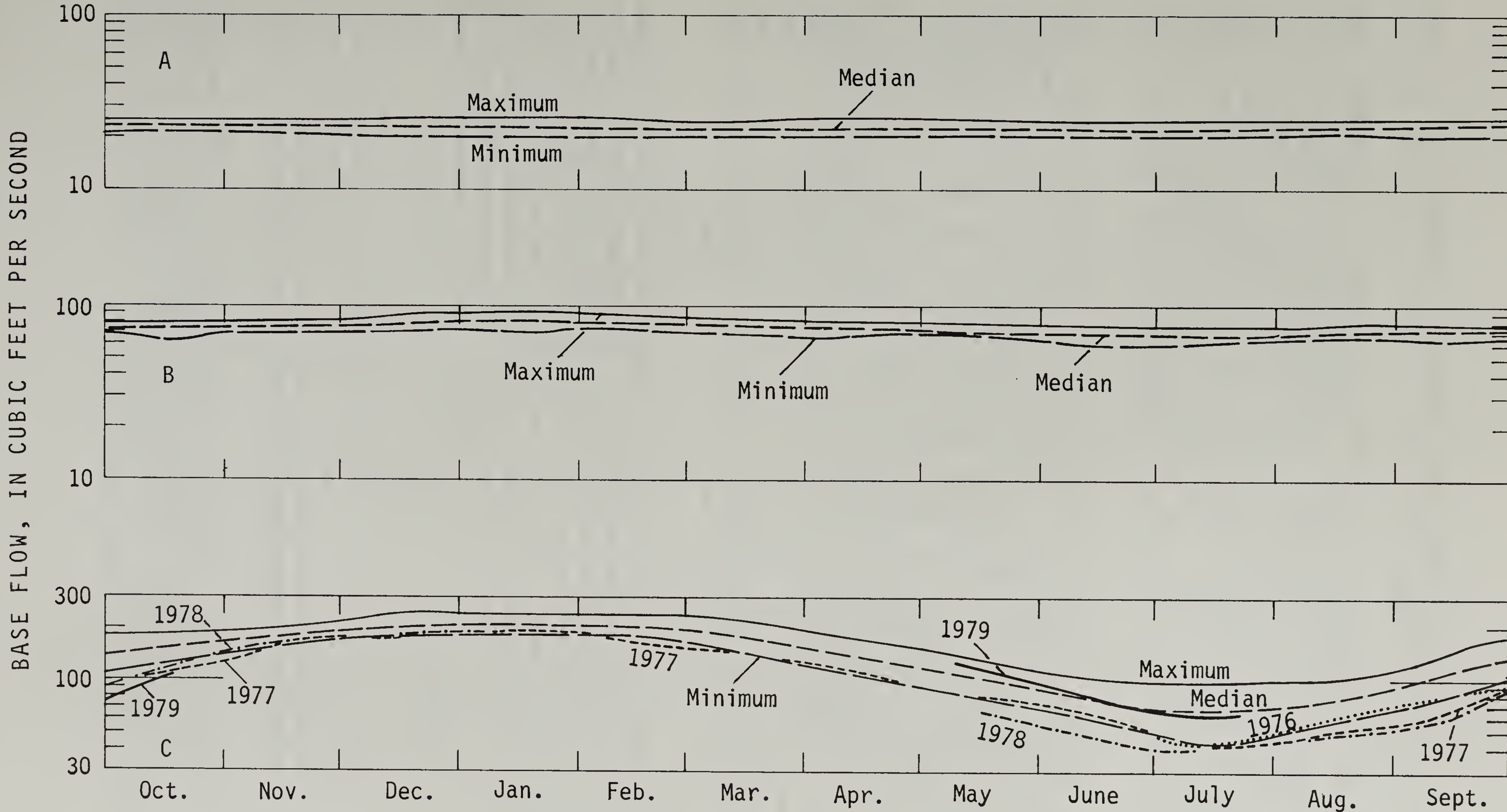


Figure 4.--Distribution of base flow for the Verde River. A, Verde River near Paulden, 1965-78. B, Verde River near Clarkdale, 1966-78. C, Verde River near Camp Verde, 1935-45, and intermittent data for 1976-79.

only 8 percent of the loss that occurs between Clarkdale and the East Verde River (Anderson, 1976).

Base flow from the station near Clarkdale to the station near Camp Verde is not accurately quantified because of the variation in river discharge caused by the operation of irrigation-ditch systems (pl. 3). The lateral diversions for water use along the ditches are operated by individuals with surface-water rights and can vary hourly. Return flow to the Verde River can occur at many sites along the ditches where gates are installed or ditches leak. The gates are used to maintain a certain quantity of water in the ditch and therefore the amount of water returning to the river varies with the amount of water used from the ditch.

A seepage investigation made during a period of summer base flow in June 1979 identified the amount of tributary inflow, diversion, irrigation return flow, and ground-water seepage. During the seepage investigation, the amount of discharge in the Verde River at the gage was approximately the same as the median base flow for the period of record (fig. 4C); therefore, the discharge measurements may be indicative of median base-flow conditions. A complete record of all the changes in the diversions and returns during the investigation was nearly impossible to obtain, which prevented use of the data for an accurate determination of streamflow gains and losses. Three significant findings about ground-water inflow, however, resulted from the seepage investigation: (1) the reach between 5th Street at Cottonwood and the OK ditch diversion near Cornville gains inflow, (2) the reach between Beaver Creek and West Clear Creek also gains inflow, and (3) the reach from West Clear Creek to Fossil Creek has no significant seepage gains or losses.

The purpose of the seepage investigation was to assign average gains and losses to the reaches between the measuring sites, but no quantities were assigned because many of the conditions present could not be averaged. Analysis of the data and the prevailing conditions during the investigation indicated that the streamflow fluctuated with time; therefore, the measurements reflect different conditions. Discharge varied owing to irrigation returns and a diurnal change caused by daily fluctuation in evapotranspiration. Additional ditch returns unknown during this investigation were discovered in the southern part of the Verde Valley on subsequent field trips. Prior to the investigation, some of the study area had rain; during the investigation, the Verde River near Camp Verde gaging station showed decreasing daily discharge on a streamflow-peak recession. On June 12, the air temperature rose about 20°F, and because the evapotranspiration rate changes with temperature, the conditions after the temperature rise were not in equilibrium.

Records for the station near Clarkdale from June 1915 to June 1921 indicate that the base flow is virtually identical to the base flow computed for records collected from April 1965 to September 1978. The lack of change suggests that the ground-water system upstream from Clarkdale still represents equilibrium conditions.

The gaging station near Camp Verde was operated from 1935-45 and was reactivated to measure low flows in 1976 (pl. 3). Records from July 1976 to January 1978 are nearly complete, but base-flow data are intermittent after January 1978 owing to sustained high flows during the winter and early spring months. This coincides with a change in the rainfall pattern in which the winters were wetter and the summers dryer. Winter base flow for 1977 and 1978 is close to the minimum hydrograph, which indicates winter base flow is virtually unchanged since 1935 (fig. 4C). The 1976 summer base flow hydrograph is close to the minimum hydrograph, whereas in 1977 and 1978 they are below the minimum hydrograph except for mid-July, which coincides with the lowest part of the minimum hydrograph. During the summer of 1979, the base-flow hydrograph was close to the median hydrograph. During the summers of 1977 and 1978, the river reached base flow on a few isolated days and provided only limited definition for the base-flow hydrograph. These possible changes in summer base flow since 1945 may be an indication that either evapotranspiration or irrigation usage has increased over the years, but no comparative data on irrigation use or amount of riparian vegetation along the Verde River are available to test this assumption. Because winter base flow has remained constant and the summer 1979 base flow returned to the median hydrograph, the assumption can be made that the summer changes in base flow reflect irrigation or vegetation changes and that no changes in base flow occurred because of changes in discharge from the aquifer. Continued monitoring at this site might help to clarify the analysis.

Sycamore Creek

Perennial flow in Sycamore Creek begins near Parsons Spring about 4.2 mi upstream from the mouth (pl. 3). Summers Spring, about 1.8 mi upstream from the mouth, provides about 5 to 7 ft^3/s of the flow in Sycamore Creek as indicated by seven measurements made at the spring during 1956-63. On seven occasions from 1956-77, base flow near the mouth of Sycamore Creek was measured; flows ranged from 7.44 ft^3/s to 9.42 ft^3/s and averaged 8.5 ft^3/s. On the basis of the sparse data, ground-water discharge to Sycamore Creek appears to have been rather constant over at least the past 20 years.

Bitter Creek

Bitter Creek drains the area in the Black Hills northeast of Jerome. A number of springs are scattered throughout the drainage area. Mine drainage from the United Verde Mine and adjacent leach dumps drain into a tributary of Bitter Creek and contribute flow to Bitter Creek. Discharge measurements made at the mouth of Bitter Creek from March to November 1980 by the Arizona Department of Water Resources (written commun., 1980) ranged from 1.4 to 4.7 ft^3/s, and the median value was 1.6 ft^3/s.

Oak Creek

Oak Creek begins at the confluence of Sterling Canyon and Pumphouse Wash, and perennial flow originates at Sterling Springs in Sterling Canyon. Base-flow measurements were made at sites along Oak Creek on January 20, 1975. The base flow of Oak Creek 0.9 mi above Indian Gardens is provided by Sterling Springs and numerous small springs along Oak Creek and West Fork Oak Creek and is 13 ft^3/s. Base flow increased to 35 ft^3/s 0.75 mi downstream from Indian Gardens owing to discharge from springs in Munds Canyon near its mouth and ground-water seepage into Oak Creek along a cross-canyon fault just downstream from Indian Gardens (pl. 3). Base flow totals 42 ft^3/s in the Page Springs area and 59 ft^3/s at a site 0.5 mi south of the community of Page Springs. Only 3 ft^3/s of the 6 ft^3/s discharged by a spring along Spring Creek reaches Oak Creek (Levings, 1980).

The longest period of record for a gaging station in the upper Verde River area is for Oak Creek near Cornville. The median base flow at this station ranges from about 37 ft^3/s (fig. 5A) in late January and early February to about 16 ft^3/s in early July. This pattern of base flow was constant for the period 1949-72 with the exception of two wet years—1949 and 1965. The gaging station is in a gaining reach; therefore, the record applies only to that specific site. Levings (1980) correlated miscellaneous measurements made downstream from the gage with the station record to compute a winter base flow of 59 ft^3/s below the gaining reach in which the gage is located. To calculate a winter base flow at the mouth of Oak Creek, the relation between the gage and the miscellaneous site (Levings, 1980, p. 13) was used to determine whether or not additional ground water inflows between the miscellaneous site and the mouth of the river. Flow at the gage on June 12, 1979, was recorded as 20 ft^3/s. Using an average June-July ratio of 0.51, the flow at the miscellaneous site would be 39.2 ft^3/s. Accounting for the 3 ft^3/s of base flow contributed by Spring Creek, the flow at the mouth of Oak Creek should be 42.2 ft^3/s. During a seepage run June 12, 1979, the flow at the mouth of Oak Creek measured 42.3 ft^3/s. Therefore, the assumption can be made that little or no additional inflow to the river occurs along this reach and the winter base flow of 62 ft^3/s at the mouth is the value at the miscellaneous site plus Spring Creek.

Beaver Creek

Beaver Creek drainage basin is divided into two major sub-basins drained by Wet Beaver Creek and Dry Beaver Creek, which merge at McGuireville to form Beaver Creek. As the names suggest, Wet Beaver Creek is perennial and Dry Beaver Creek is intermittent. Six gaging stations have been operated by the U.S. Geological Survey in the Beaver Creek basin. Three stations are at perennial sites—Wet Beaver Creek near Rimrock, Montezuma Well outlet near Rimrock, and Beaver Creek at Camp Verde. Three stations are at intermittent sites—Red Tank Draw

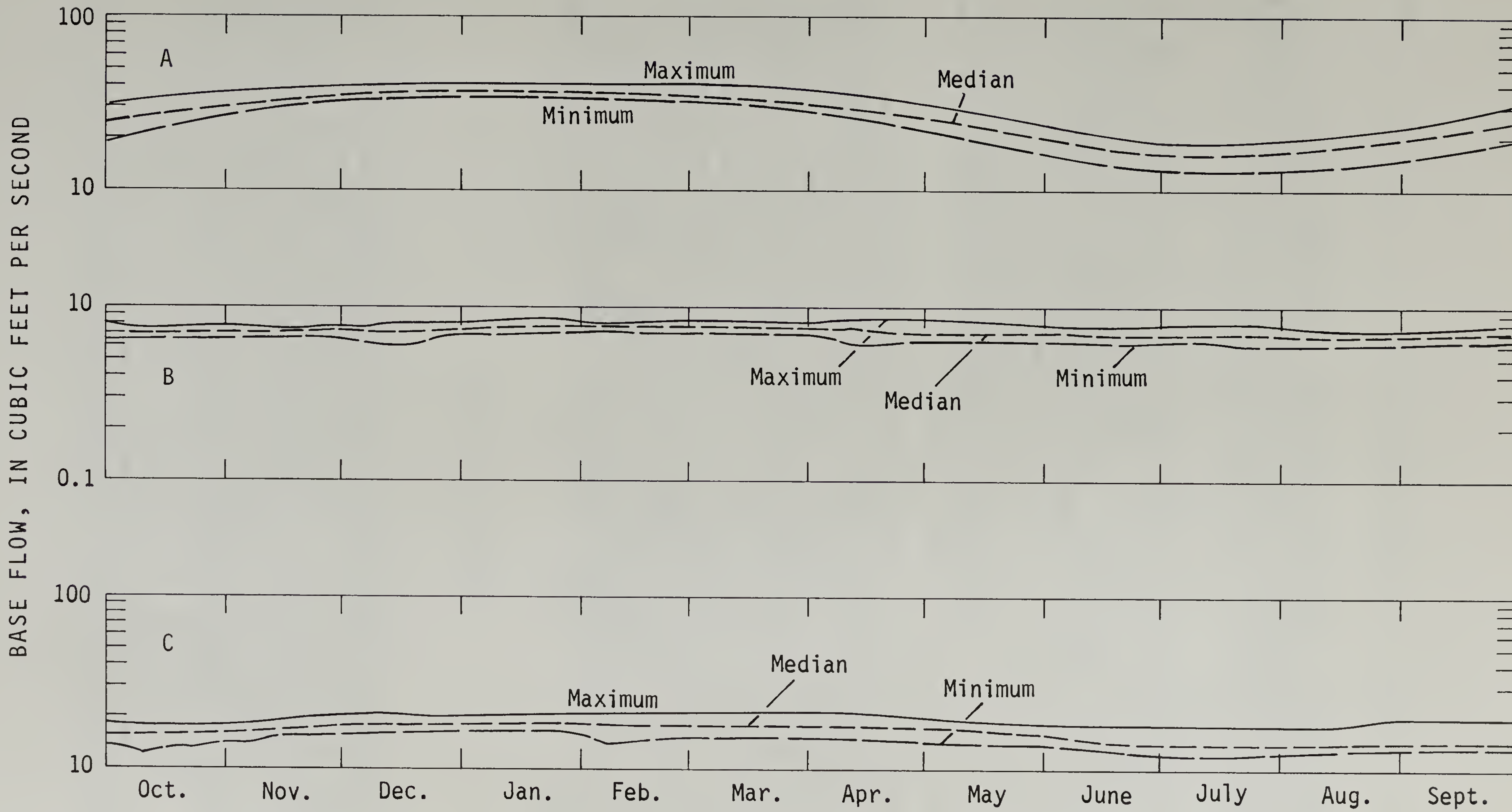


Figure 5.--Distribution of base flow for tributaries of the Verde River. A, Oak Creek near Cornville, 1950-64 and 1966-78. B, Wet Beaver Creek near Rimrock, 1961-78. C, West Clear Creek near Camp Verde, 1966-78.

near Rimrock, Rattlesnake Canyon near Rimrock, and Dry Beaver Creek near Rimrock (pl. 3).

Dry Beaver Creek has two short perennial reaches—one at Beaverhead Spring about 1 mi downstream from Highway 179 and the other at McGuireville between Interstate Highway 17 and the confluence with Wet Beaver Creek (pl. 3). Both perennial reaches are less than 2 mi long.

Wet Beaver Creek is perennial from its source at springs in sec. 14, T. 15 N., R. 7 E., to the confluence with Dry Beaver Creek, which is a distance of about 20 mi. The accumulated spring discharge at the gaging station, Wet Beaver Creek near Rimrock, averages about 7 ft^3/s. Base flow generally ranges from about 6 to 8 ft^3/s (fig. 5B). Montezuma Well, a tributary spring to Wet Beaver Creek, yields a fairly constant flow of about 2.5 ft^3/s. The flow from Montezuma Well has been diverted at intervals since prehistoric times, and some prehistoric ditches are still being used. The amount of flow from Montezuma Well that actually reaches Wet Beaver Creek is unknown.

Beaver Creek extends about 9 mi from the confluence of Wet Beaver Creek and Dry Beaver Creek to the Verde River. Beaver Creek is perennial from the confluence of Wet and Dry Beaver Creeks to Montezuma Castle National Monument. During summer months, all or part of the flow in Beaver Creek above Montezuma Castle National Monument is diverted for irrigation. In the 1-mile reach above its mouth, the flow in Beaver Creek is interrupted; two observations of no flow were made 0.1 mi upstream from the mouth of Beaver Creek during the summer of 1937. During the seepage investigation of June 12, 1979, measurements of the water in an irrigation ditch 0.8 mi above the mouth of Beaver Creek, Beaver Creek above the ditch, and Beaver Creek at the mouth showed a 6 ft^3/s gain owing to ground-water seepage between the ditch and the mouth. This seepage is thought to be subsurface return flow from irrigation.

West Clear Creek

West Clear Creek begins as a perennial stream at the confluence of Clover Creek and Willow Creek in sec. 33, T. 14 N., R. 9 E., and flows westerly for about 37 mi to the Verde River. On December 1, 1966, during a period of base flow, the flow in West Clear Creek 0.3 mi below Willow Creek was 1.88 ft^3/s, of which 0.79 ft^3/s was contributed by Willow Creek. Several springs along West Clear Creek increased the flow to 19 ft^3/s at the gaging station near Camp Verde (pl. 3). Diversions for the irrigation of about 300 acres downstream from Forest Highway 9 often fully deplete the flow of West Clear Creek (pl. 3). Analysis of the streamflow records collected at the gaging station from December 1964 to September 1978 indicate that base flow averages about 16 ft^3/s and varies seasonally from about 12 ft^3/s in the summer to about 18 ft^3/s in the winter (fig. 5C).

Fossil Creek

Fossil Creek is fed by Fossil Springs, (A-12-7)14d (pl. 2), which rise near the head of Fossil Creek Canyon about 3.5 mi northwest of Strawberry (fig. 1). The flow of Fossil Springs is diverted via pipeline to power two hydroelectric powerplants at Irving and Childs (pl. 2); downstream from the diversion, Fossil Creek is intermittent (fig. 1). Since 1952, the U.S. Geological Survey has gaged the powerplant diversion where the flume spills into Stehr Lake, which is a head-stabilization pond for the Childs powerplant. The record represents virtually all the flow of Fossil Springs and indicates that the discharge is fairly constant at about 43 ft^3/s (U.S. Geological Survey, 1979, p. 413).

Availability of Streamflow

No surface-water impoundments are along the Verde River and its major tributaries to store or control the streamflow. The primary use of surface water in the upper Verde River area is for irrigation. Important secondary uses include recreation, esthetic enjoyment, and fisheries. All these uses rely mainly on the amount of water present during low flows. The amount of streamflow varies with time and by location throughout the study area as a function of runoff-producing storms and evapotranspiration. In the Verde Valley the streamflow variation is greatest because, in addition to runoff and evapotranspiration, year-round diversion ditches remove water from the streams for irrigation. Gaging stations in the study area can be used as index stations for annual flow characteristics along the streams. Low-flow frequency and flow-duration curves were selected to show the availability of water with time.

Flow Duration

A flow-duration curve is a cumulative frequency curve that shows the percentage of time during the period studied that a specified rate of flow was equaled or exceeded. The curve provides a useful method for analyzing the availability and variability of streamflow without regard to the sequence of the flow events. The distribution of streamflow with respect to time is a function of many variables including the amounts and type of precipitation, topography, soils, geology, vegetal cover, ground-water movement, and water-use patterns.

Flow-duration curves provide a convenient method for studying the flow characteristics of streams and can be used to determine the relative suitability of different streams for development of a water supply.

The slope of the flow-duration curve is a good indication of the capacity of a basin to store water. Storage tends to lower the variability of flow by reducing the peak flows and spreading the same volume of runoff over a longer time period. A steeply sloping duration curve indicates high variability in flow rates and small amounts of natural storage, and a gently sloping curve indicates a low variability, which is characteristic of a consistent component of base flow per unit drainage area.

Flow-duration curves for selected sites in the study area are shown in figure 6. The data on which these curves are based were obtained by computer analysis of the daily streamflow records. At all the sites, the shape of the curves is characterized by a steeply sloping line in the low-exceedence—less than about 15 or 20 percent—or high-flow range indicating that streamflow is in direct response to precipitation. In the upper Verde River area, the flow-duration curves can be divided into two groups as characterized by the low flow end of the curves. The low-flow characteristics depend on location and correlate with irrigation use of surface water. Flow-duration curves for gaging-station sites that have fairly steady base flows are shown in figure 6A. The slope of the curves changes sharply into a mildly sloping line in the high-exceedence or low-flow range, which indicates high storage and low variability in base flow. For the low-flow ranges, the storage is provided by the regional aquifer rather than surface-water impoundments. Flow-duration curves for gaging-station sites (pl. 3) that have a much larger variability (steeper slope) of base flow are shown in figure 6B. All four stations are in or near irrigated areas. Large consumptive use of water upstream from the gaging stations causes the base flow to vary considerably within a year, whereas the discharge from the regional aquifer probably is similar to the base-flow component in figure 6A. Miscellaneous measurements and continuous monitoring of spring discharges show no change in the rate of discharge that occurs from the regional aquifer at these sites.

Flow-duration curves were compared for different time periods between 1916 and 1978 at two sites upstream from the area where water use is greatest and during which base flow had not changed. No significant changes were detected in average inflow or aquifer discharge.

The shape of the flow-duration curves, but not the discharge quantities, can be used to develop curves at ungaged sites. Quantity of flow varies by location along perennial streams in the study area because of increases from ground-water discharge. The curves in figure 6A have similar characteristics in that the sites occur upstream from irrigation use, seasonal differences in evapotranspiration rates are low, and ground water is discharged from Paleozoic rocks. The characteristics of the sites for the curves in figure 6B are similar because ground water is discharged from the Verde Formation and alluvium, the seasonal differences in evapotranspiration rates are high, and numerous irrigation diversions and returns occur along the stream reaches. Any changes caused by the differences in evapotranspiration rates or geology between figures 6A and 6B are masked by the changes caused by irrigation.

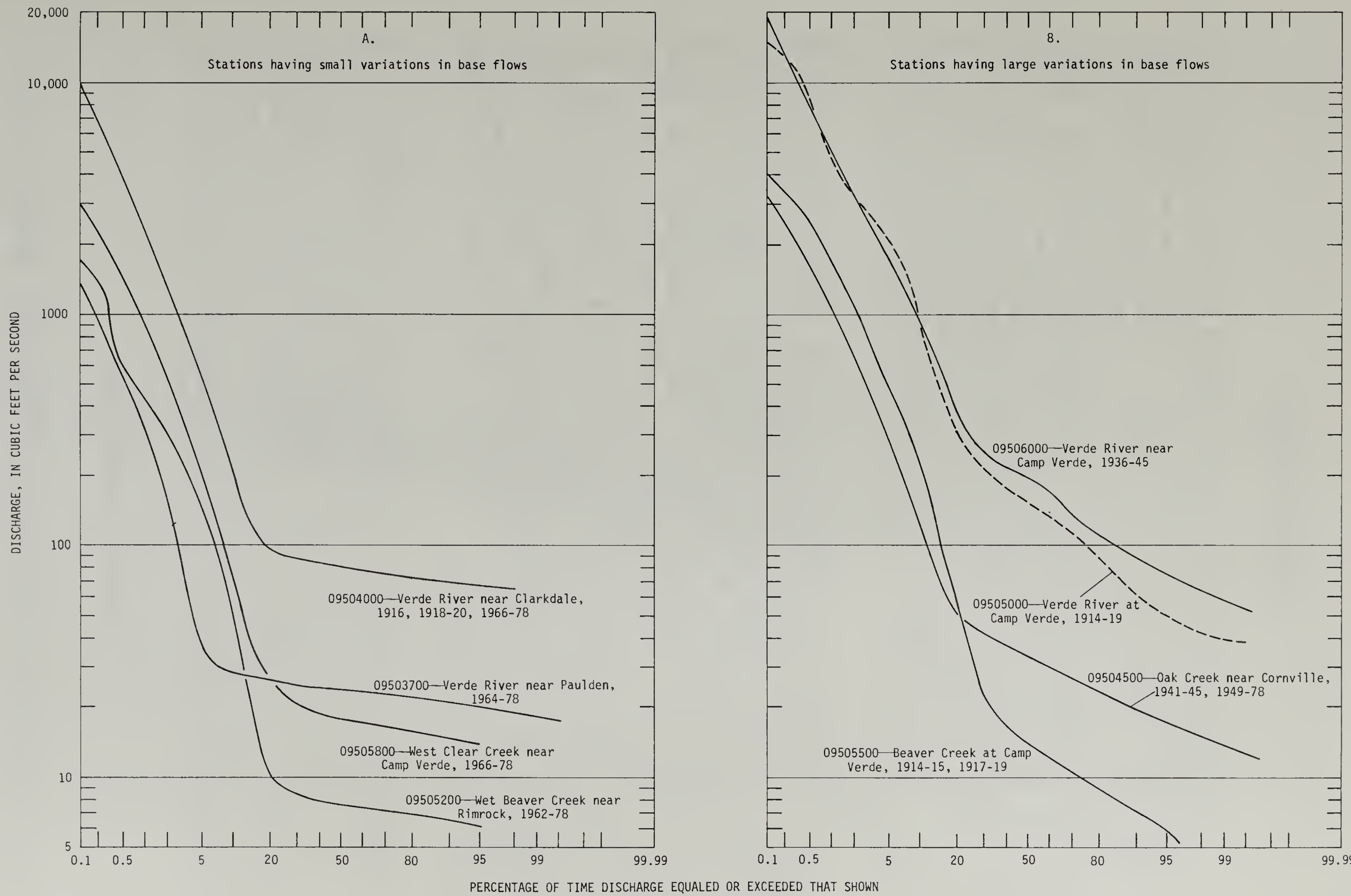


Figure 6.--Flow-duration curves of daily discharges for selected gaging stations.

Low-Flow Frequency

Low-flow characteristics at a gaging station can also be described by frequency curves. The flow of streams in the upper Verde River area is lowest in summer and early fall when evapotranspiration and the demand for irrigation water are greatest. The frequency with which low flows occur is an important factor in the management of current stream usage and may be an important measure of the effects of future ground-water development. Flow-duration curves are one way of representing low-flow frequency but do not indicate whether the low flows occurred consecutively on many days in each year or on a few days scattered throughout each year. Low-flow frequency curves relate the lowest average discharge in cubic feet per second for various periods of time in days to the frequency of occurrence in years. In these low-flow frequency studies, the daily streamflow records are analyzed by climatic year (April 1 to March 31) in order to confine the low-water season in a 1-year period.

The demand for irrigation water in the Verde Valley is largest in summer. Because no streamflow data are available prior to the installation of irrigation ditches to indicate the amount of water available for irrigation use, an annual analysis is presented at the outflow point of the valley to provide data on the water available to downstream users. Figure 7 shows a family of low-flow frequency curves for the gaging station, Verde River near Camp Verde. The curves show that on an average of about once in 10 years the mean discharges for 7- and 30-day periods are likely to be less than or equal to 51 ft^3/s and 62 ft^3/s, respectively. The shape of the frequency curves appears typical for perennial streams—smooth curves, concave upward. In streams affected by diversions, the curves deflect downward. In streams where base flow is maintained by a large-capacity ground-water reservoir, a flat frequency curve is produced. The two conditions occur upstream from this site in the Verde Valley, and the curves reflect a condition somewhere between the extremes.

The recurrence interval, stated in years, is the reciprocal of the probability of occurrence for any given year. For example, a low flow for a given period that is assigned a recurrence interval of 10 years has a 0.1 probability or 10-percent chance of occurring in any given year. The recurrence interval must not be thought of as the exact time interval between recurrences but as the average time interval between like events. The possibility exists that the 10-year low flow can occur in several consecutive years if the average recurrence over a long period of time is only once in 10 years. Low-flow frequency data and other flow characteristics for perennial streams are presented in table 6.

Quality of Surface Water

The chemical, physical, and biological quality of water determines the suitability of water for given uses. The following evaluation

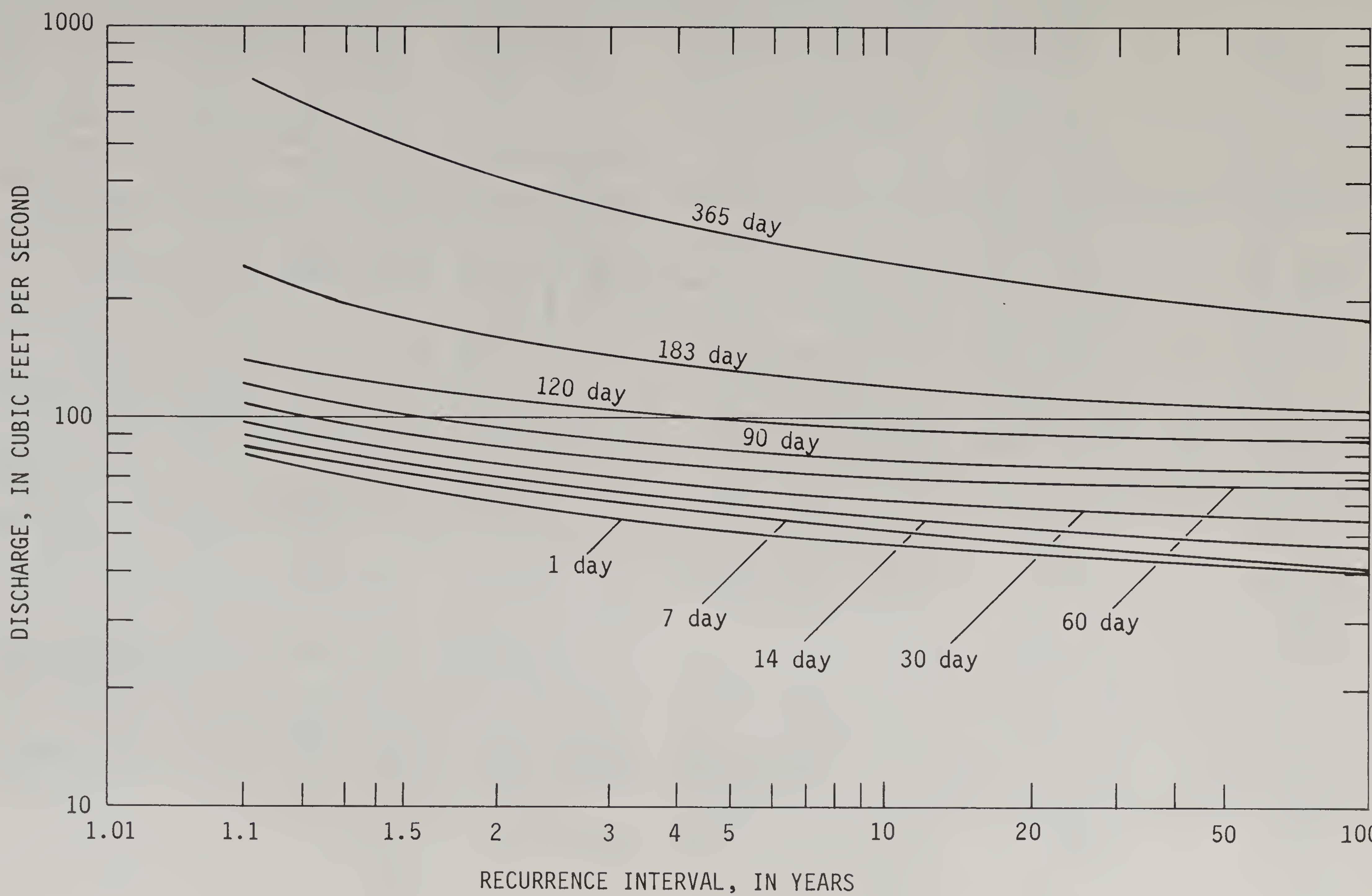


Figure 7.--Low-flow frequency curves for Verde River near Camp Verde, 1935-45.

Table 6.--Streamflow characteristics at selected sites

Station number	Station name	Period of record, calendar years	Drainage area at gage, in square miles[2]	Annual volume of base flow, in acre-feet	Winter base flow,[1] in cubic feet per second	Discharge equaled or exceeded, in cubic feet per second		Average 7-day low flow for indicated recurrence interval			Average 30-day low flow for indicated recurrence interval		
						50 per-cent of time	90 per-cent of time	2 years	10 years	20 years	2 years	10 years	20 years
09503700	Verde River near Paulden	1963-78	2,530	16,000	22	24.0	21.0	20.9	17.6	16.4	21.7	18.7	17.5
09504000	Verde River near Clarkdale	1915-21, 1965-78	3,520	54,000	75	82.0	69.0	67.8	61.5	59.8	70.4	64.3	62.7
09504500	Oak Creek near Cornville[3]	1940-45, 1948-78	357	20,000	37	33.0	19.0	15.5	12.2	11.2	17.3	14.0	13.2
09505200	Wet Beaver Creek near Rimrock.....	1961-78	111	5,000	7	7.7	6.3	6.4	5.9	5.7	6.6	6.1	5.9
09505800	West Clear Creek near Camp Verde............	1964-78	241	12,000	17	18.0	14.0	13.0	12.0	11.8	14.0	12.5	12.2
09506000	Verde River near Camp Verde......	1934-45, [5]1976-79	5,024	[4]80,000	200	190	85.0	66.2	51.3	47.5	75.9	62.0	58.9

[1]Winter base-flow conditions occur during January, February, and March.

[2]Drainage areas of the Verde River are approximate and include 373 mi^2 in Aubrey Valley Playa, a closed basin located approximately 50 mi northwest of the study area.

[3]Low flow affected by several small diversions for irrigation above station.

[4]Calculated for the 1977 water year.

[5]Operated as a low-flow station only.

of surface-water quality is directed toward three major usages—irrigation, swimming, and fisheries. Few if any domestic and industrial water supplies have been developed from surface water in the area, so those uses will not be considered in this section of the report.

Chemical Quality

During low flows, the chemical quality of surface water in the study area is closely related to the quality of ground water that supplies the base flow (pl. 3). During medium and high flows, the dissolved-solids concentration is diluted by snowmelt or surface runoff that have a lower dissolved-solids concentration.

The dissolved-solids concentrations range from 32 to 1,570 mg/L for 211 samples collected throughout the study area during all ranges in flow (table 14). Samples collected from perennial streams during low flows seldom have dissolved-solids concentrations less than 200 mg/L except at sites in Oak Creek upstream from Page Springs and in Wet Beaver and West Clear Creeks upstream from where they emerge from their canyons into the Verde Valley. During low flows, the dissolved-solids concentrations generally increase in the downstream direction (fig. 8) owing to increased dissolved solids in ground water from the Verde Formation, particularly in the southern part of the Verde Valley (pl. 3).

In the Verde River upstream from Camp Verde and in the perennial tributaries to the Verde River, the dominant ions generally are calcium, magnesium, and bicarbonate (pl. 3). Exceptions are a sample taken in 1977 from the Verde River near the upstream limit of the study area in which the major ions are calcium, sodium, magnesium, and bicarbonate, and a sample taken in 1979 from Fossil Creek in which the major ions are calcium, magnesium, and sulfate (table 14).

The relation of dissolved solids and specific conductance was determined to compare two sites on the Verde River above and below the area where the water quality changes. Using a least squares best fit method on the data collected during the 1976-79 water years, the relation of dissolved solids to specific conductance is similar at both sites (fig. 9). The major cations and anions can be related also to specific conductance at the Verde River near Camp Verde site as shown on figure 10. Correlation at the near Clarkdale site was poor because the concentrations of sodium, sulfate, and chloride were low. Only calcium, magnesium, and bicarbonate show a relation to specific conductance.

In June 1979 the dissolved-solids concentration of flow in the Verde River increased from 403 mg/L near the mouth of Beaver Creek to 550 mg/L above West Clear Creek (fig. 8). Coincident with the increase in dissolved solids, the sodium and sulfate ions increased; however, calcium, magnesium, and bicarbonate generally continued to be the dominant ions (pl. 3). The increase in dissolved solids and the change

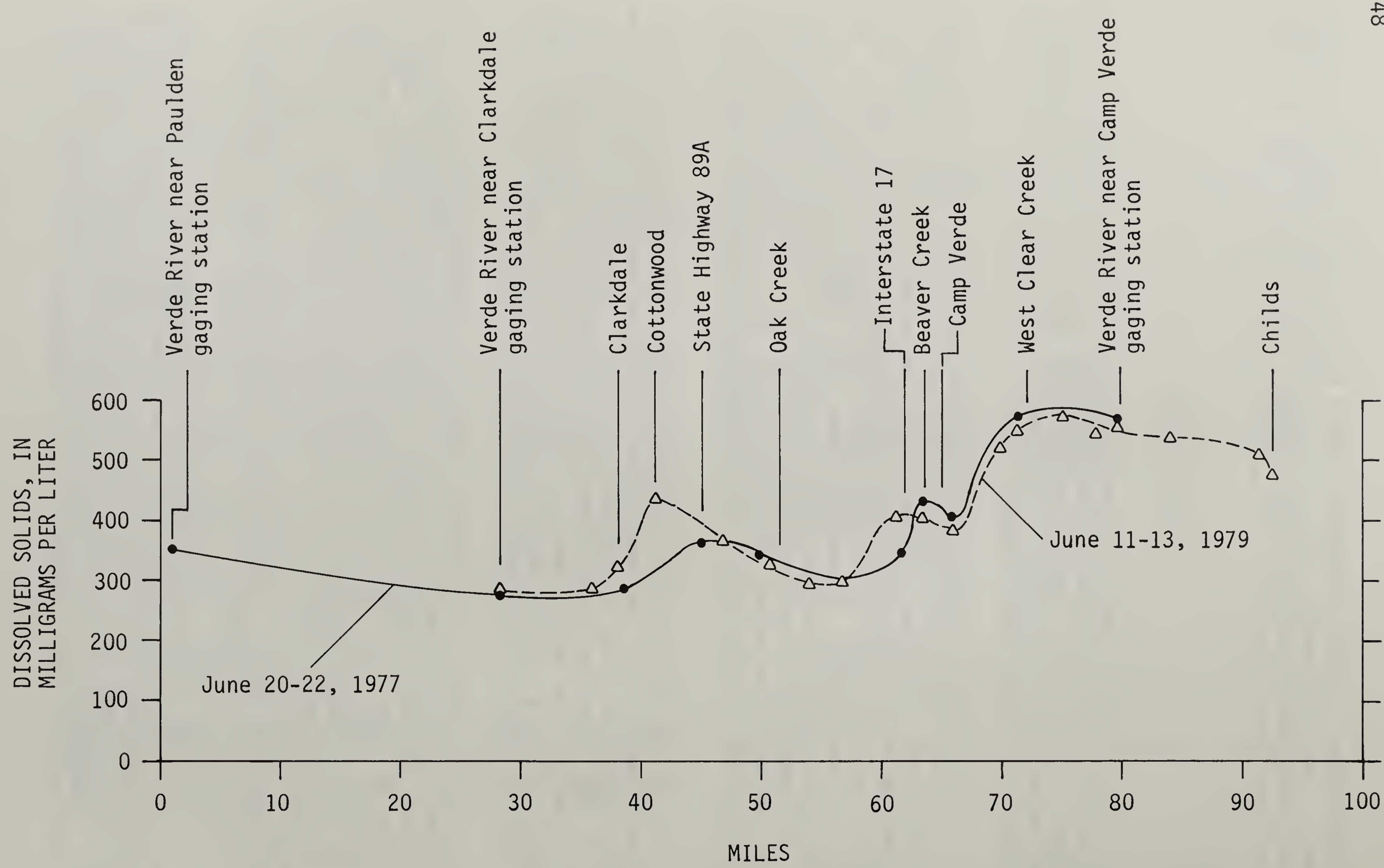


Figure 8.--Dissolved-solids concentrations during low flow at selected sites along the Verde River.

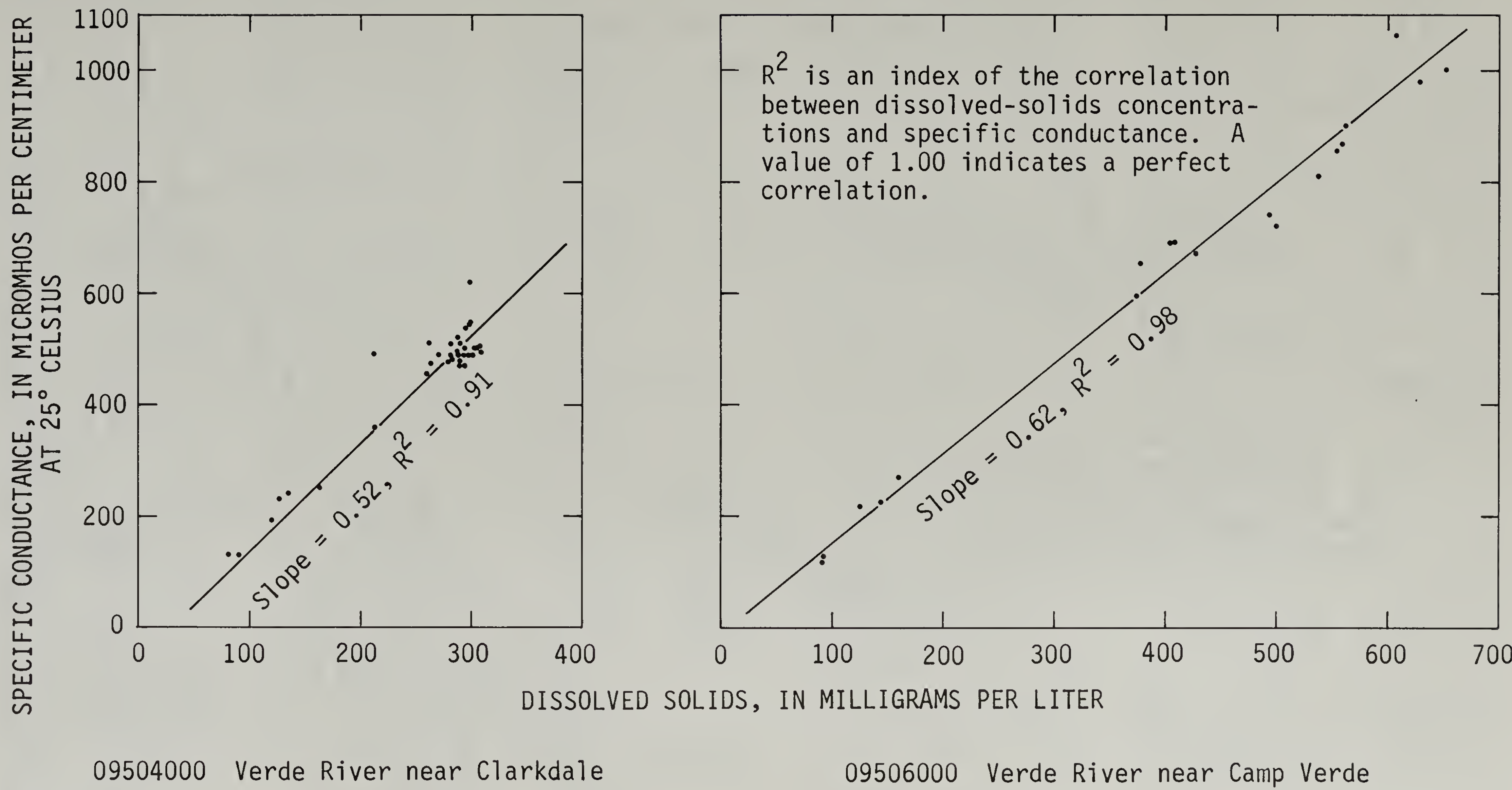


Figure 9.--Relation of dissolved-solids concentrations to specific conductance at Verde River near Clarkdale and Verde River near Camp Verde, 1976-79 water years.

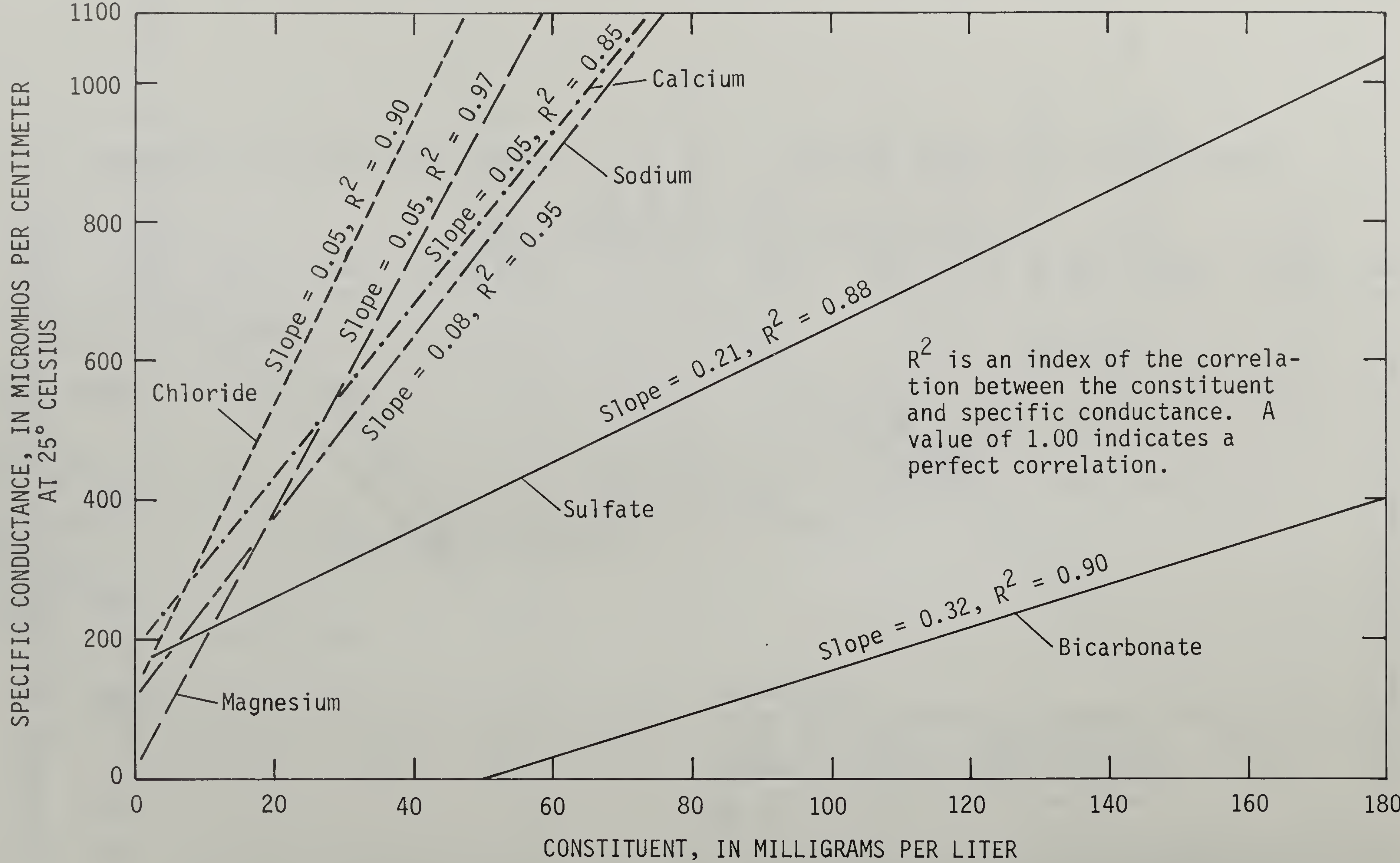


Figure 10.--Relation of major constituents to specific conductance in Verde River near Camp Verde, 1976-79 water years.

in the concentrations of the major ions are the result of ground-water inflow to the river. The increased presence of sodium and sulfate ions probably is the result of the solution of these ions by ground water moving through salt and gypsum deposits in the Verde Formation.

A similar but less obvious increase in the dissolved-solids concentrations of the Verde River occurs between Clarkdale and U.S. Highway 89A (fig. 8). This increase in dissolved solids probably is the result of ground-water inflow to the river. The ground water is moving through the Verde Formation where solution of limestone probably increases the dissolved-solids concentration. In this instance the relative concentrations of major ions in the river water remain unchanged.

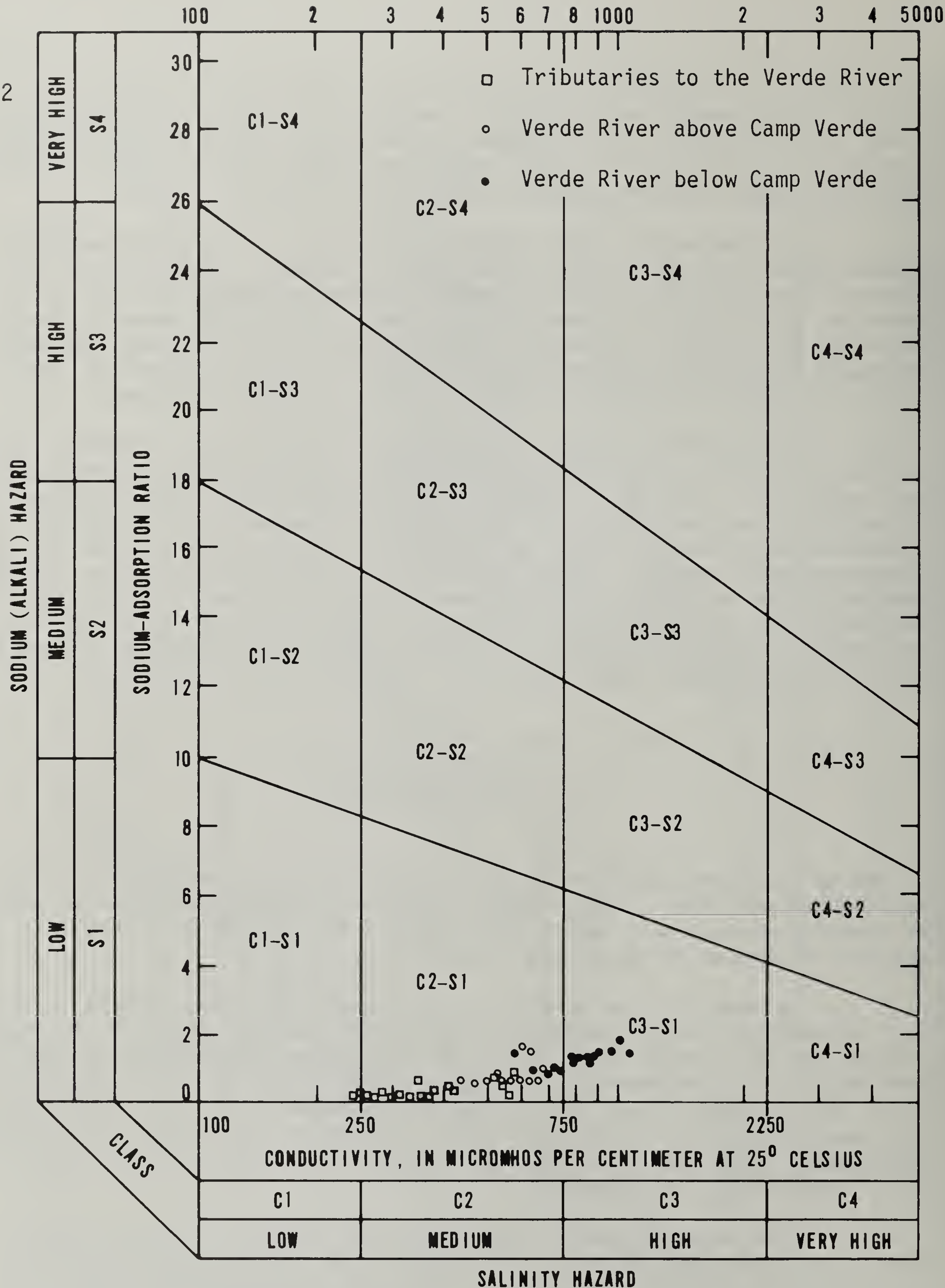
The greatest single use of surface water is for irrigation, and the surface water in the upper Verde River area generally is well suited for that use. The U.S. Salinity Laboratory Staff (1954) devised a classification system that can be used to evaluate the suitability of irrigation water on the basis of the sodium hazard and the salinity or dissolved-solids hazard. Large concentrations of sodium in relation to the concentrations of calcium and magnesium tend to cause a breakdown of soil structure and also may harm plants by causing a toxic accumulation of sodium in the plant tissue. A common measure of the sodium hazard is the sodium-adsorption ratio (SAR) that is defined by the equation

$$SAR = \frac{(Na^{+})}{\sqrt{\frac{(Ca^{+2}) + (Mg^{+2})}{2}}},$$

in which the concentrations of the constituents are expressed in milliequivalents per liter. The salinity hazard is commonly evaluated in terms of specific conductance, which is a measure of the ability of the ions in solution to conduct an electrical current.

In most of the streams in the area the sodium hazard is low, but the salinity hazard generally ranges from low to medium in the tributaries and the Verde River north of Camp Verde and medium to high in the Verde River downstream from Camp Verde (fig. 11). No major diversions for irrigation occur in the reach downstream from Camp Verde, but the possibility exists that with correct selection of crops and proper agricultural practices even the water with a high salinity hazard could be used successfully for irrigation.

The Arizona Water Quality Control Council (written commun., 1979) listed maximum contaminant levels for 16 toxic substances in three categories of surface-water uses (table 7). In general, only a few samples exceeded these standards. In most cases the large concentrations in the total recoverable form are associated with the large sediment concentrations during high flows (table 14). Except for lead and phenols, the chemical quality of surface water is fairly well suited to the current uses. Although some samples contained lead and phenols in excess of the



NOTE: Low-sodium water (S1) can be used for irrigation on most soils. Low-salinity water (C1) can be used for irrigation with most crops on most soils; however, medium- to high-salinity water (C2 and C3) can be used for irrigation if the soil is permeable, drainage is adequate, and salt-tolerant crops are grown.

Figure 11.--Sodium and salinity hazards of irrigation water. Diagram from U.S. Salinity Laboratory Staff (1954).

Table 7.--Surface-water chemical-quality standards[1] for designated uses and number of samples exceeding the limits

[T, total recoverable; D, dissolved; and N/S, no standard]

Parameter	Number of samples	Form analyzed for	Concentrations, in micrograms per liter		Recreational use: Full body contact[2]		Aquatic and wildlife use		Agricultural use: Irrigation		Agricultural use: Livestock watering	
			Minimum	Maximum	Allowable limit, in micrograms per liter	Number of exceed-ences	Allowable limit, in micrograms per liter	Number of exceed-ences	Allowable limit, in micrograms per liter	Number of exceed-ences	Allowable limit, in micrograms per liter	Number of exceed-ences
Arsenic	145	T	1	45	D50	0	D50	0	T2,000	0	T200	0
Barium	145	T	0	1,200	D1,000	1	N/S	----	N/S	----	N/S	----
Boron	201	D	0	530	N/S	----	N/S	----	T1,000	0	N/S	----
Cadmium	143	T	0	15	T10	3	D10	0	T50	0	T50	0
Chromium (Hexavalent and Trivalent).......	145	T	0	60	D50	1	D50	1	T1,000	0	T1,000	0
Copper...........	146	T	0	340	N/S	----	D50	3	T5,000	0	T500	0
Lead	141	T	0	150	[2]D50	16	[3]D50	16	T10,000	0	T100	3
Manganese	146	T	0	1,900	N/S	----	N/S	----	T10,000	0	N/S	----
Mercury..........	143	T	0	4.5	T2	1	T2	1	N/S	----	10	0
Selenium	143	T	0	9	D10	0	T50	0	20	0	50	0
Silver	145	T	0	30	D50	0	D50	0	N/S	----	N/S	----
Zinc	145	T	0	280	N/S	----	D500	0	25,000	0	25,000	0
Cyanides (As cyanide ion and complexes)..	146	T	0	20	200	0	20	0	N/S	----	200	0
Phenolics.........	145	T	0	10	5	6	5	6	N/S	----	5	6

[1]Standards set by the Arizona Water Quality Control Council (written commun., 1979).

[2]When "Partial Body Contact" is the only designated use for a surface-water segment, the allowable limits listed for "Full Body Contact" shall apply until possible adverse health effects are better understood for "Partial Body Contact" use and limits are assigned.

[3]Of the 141 analyses for total recoverable lead, 60 reported "<100 μg/L." Some or all of these 60 samples may have exceeded the 50 μg/L; however, for this table it is assumed that they did not exceed the standard.

Arizona Water Quality Control Council (written commun., 1979) standards for surface-water uses (table 7), no adverse effects have been documented by local and State agencies.

During 1980, the Arizona Department of Health Services has been sampling the water at the mouth of Bitter Creek and on a tributary stream into which the drainage from the United Verde Mine and adjacent leach dumps flow. The quality of the water in Bitter Creek is affected by the mine drainage (Milne, 1981). Water from the sampling site on the tributary stream exceeds the surface-water standards for sulfate, dissolved solids, copper, zinc, manganese, iron, and cadmium. Water at the mouth of Bitter Creek contains concentrations of sulfate, dissolved solids, copper, zinc, manganese, and iron that exceed the standards for surface-water uses but are dilute compared to the tributary sampling site. At the mouth of Bitter Creek, dissolved-solids concentrations range from about 1,150 to 1,750 mg/L, whereas at the tributary site the range is from about 4,600 to 6,000 mg/L (T. D. Love, Arizona Department of Health Services, written commun., 1980).

Bacteriological Quality

From March 1976 through October 1979, the U.S. Geological Survey analyzed 147 surface-water samples taken at 21 different sites in the area for determination of fecal coliform bacteria. Fecal coliform bacteria are present in the intestines and the feces of warmblooded animals. The presence of fecal coliform organisms may indicate recent and possibly dangerous contamination (Greeson and others, 1977). The fecal coliform counts were from <1 to 1,900 colonies/100 mL (milliliters) (table 14). The most stringent maximum allowable limits set for fecal coliform in surface water by the Arizona Water Quality Control Council (written commun., 1979) is for full body contact or swimming. On the basis of a minimum of five samples, the fecal coliform content of recreation waters shall not exceed a geometric mean of 200 colonies/100 mL. No more than 10 percent of the samples for a 30-day period shall exceed 400 colonies/100 mL nor exceed 800 colonies/100 mL for a single sample.

The bacteriological data collected by the U.S. Geological Survey are too scattered in time to allow an evaluation of the waters in the specific terms of the above standard except under the single-sample category. Six samples, three at Oak Creek near Cornville and three at different sites on the Verde River, exceed the maximum allowable limit of 800 colonies/100 mL. Therefore, the data do indicate that there are sites where, for at least short periods, fecal pollution may be a potential hazard to swimmers.

At three sites on the Verde River and three sites on Oak Creek during 1976-79 (table 14), monthly coliform counts were made for at least 1 year. Although the data are scattered, fecal coliform counts generally were higher in the summer months. The trend toward high fecal coliform

counts during the summer may be the result of increased streamside recreation and tourist visitation. Fecal coliform counts at a popular swimming area on Oak Creek increased drastically in response to intensified recreational use during holiday weekends, such as Labor Day, Memorial Day, and Independence Day (Obr and others, 1970). High fecal coliform counts may also result from livestock, wild mammals, and birds defecating in or close to streams.

Suspended-Sediment Concentrations

The suspended-sediment concentrations found in streams in the area are generally less than 50 mg/L at low flow but, during periods of high flow, concentrations have been found to be as much as 9,280 mg/L. Suspended-sediment data collected by the U.S. Geological Survey through September 1979 are given in table 8.

Water-quality criteria for surface water offer few quantitative guides for evaluating suspended-sediment concentrations relative to the suitability of surface water for specific uses. Qualitatively speaking, when concentrations are too high, problems that are likely to result in the study area include: (1) decreasing the esthetic attraction of the streams, (2) clogging the irrigation-distribution systems, and (3) degradation of fisheries. None of these problems appears to be a serious concern in the study area probably because the high flows associated with large suspended-sediment concentrations often cause much more damage than the movement of sediment. Additionally, large suspended-sediment concentrations, because they are related to high flows, are generally of short duration; therefore, the streams tend to clear rapidly.

WATER BUDGET

In a water budget for the regional aquifer, if no change occurs in the volume of water in storage, inflow equals outflow and the system is in steady state or equilibrium. Under transient or nonequilibrium conditions, inflow and outflow are not in balance and the difference is made up by a change in storage. In the upper Verde River area, no appreciable declines in water levels in wells have occurred. There are no significant changes between the water-level contours mapped by Twenter and Metzger (1963) and Levings and Mann (1980), and those shown on plate 1. Differences are generally a result of more and sometimes better data; therefore, changes in storage in the regional aquifer are zero—inflow equals outflow. A total water budget could not be computed because records of total surface outflow are not available; therefore, only a low-flow budget was evaluated as a first approximation of flow in the regional aquifer. Inflow to the regional aquifer is by infiltration of precipitation and streamflow. Outflow is by spring and seepage discharge to streams, pumping and flowing wells, and evapotranspiration.

Table 8.--Suspended-sediment data from selected streamflow sites

Station number	Station name	Date of sample	Time	Instantaneous discharge, in cubic feet per second	Suspended sediment: Concentration, in milligrams per liter	Suspended sediment: Discharge, in tons per day
09503700	Verde River near Paulden	06-22-77	1130	21	23	1.3
		03-01-78	1745	7,520	9,280	188,000
		11-16-78	1745	29	71	5.6
		12-14-78	1430	23	31	1.9
09504000	Verde River near Clarkdale	06-20-77	1700	73	35	6.9
		12-12-78	1100	71	26	5.0
		01-16-79	1115	78	8	1.7
		02-14-79	1530	486	74	97
		03-13-79	1620	1,130	25	76
		04-18-79	0945	131	4	1.4
		05-09-79	1730	81	12	2.6
		06-11-79	1600	83	14	3.1
		07-12-79	0945	75	18	3.6
		08-09-79	1700	72	56	11
		09-28-79	1345	77	22	4.6
344557112014600	Verde River at Tuzigoot bridge, near Clarkdale	06-21-77	1500	46	97	12
344318111592400	Verde River at Highway 89A near Cottonwood	06-22-77	1000	32	143	12
09504200	Verde River near Cornville	06-21-77	1200	43	119	14
345954111441800	Oak Creek at Cave Springs near Sedona	06-20-77	1030	4.2	385	4.4

Table 8.--Suspended-sediment data from selected streamflow sites--Continued

Station number	Station name	Date of sample	Time	Instantaneous discharge, in cubic feet per second	Suspended sediment	
					Concentration, in milligrams per liter	Discharge, in tons per day
345436111434000	Oak Creek below Indian Gardens	06-20-77	1130	30	9	0.73
344928111482000	Oak Creek at Red Rock Crossing near Sedona	06-20-77	1330	18	19	0.92
09504400	Munds Canyon tributary near Sedona	10-18-72	1515	9.5	25	0.64
09504420	Oak Creek at Sedona	10-11-78	1650	29	7	0.55
		12-13-78	1345	42	12	1.4
		04-18-79	1630	300E	4	3.2E
		05-10-79	1400	43	2	0.23
		06-14-79	1430	30	2	0.16
		07-12-79	1600	27	7	0.51
		08-11-79	1300	30	6	0.49
		09-26-79	1245	29	2	0.16
09504440	Oak Creek at Red Rock Crossing near Sedona	11-15-78	0930	99	16	4.3
		12-13-78	1030	41	6	0.66
		02-13-79	1745	158	154	66
		04-18-79	1445	303	5	4.1
		05-10-79	1130	37	8	0.80
		06-13-79	1530	20	15	0.81
		07-12-79	1330	14	18	0.68
		08-11-79	0900	18	43	2.1
		09-26-79	1500	17	5	0.23

Table 8.--Suspended-sediment data from selected streamflow sites--Continued

Station number	Station name	Date of sample	Time	Instantaneous discharge, in cubic feet per second	Suspended sediment	
					Concentration, in milligrams per liter	Discharge, in tons per day
09504500	Oak Creek near Cornville	10-20-72	1200	3,230	914	7,970
		06-20-77	1430	16	24	1.0
		03-01-78	1600	12,200	5,270	174,000
344052111561200	Oak Creek above confluence with Verde River, near Cornville	06-21-77	1000	33	37	3.3
343513111524600	Verde River at I-17 bridge, near Camp Verde	06-21-77	1000	13	59	2.1
343424111512200	Verde River 600 ft above Beaver Creek at Camp Verde	06-21-77	1500	27	84	6.1
09505200	Wet Beaver Creek near Rimrock	07-27-72	1130	12	211	6.8
		04-03-73	1340	110	10	3.0
		06-21-77	0900	6.7	6	0.11
		02-28-78	1720	70	814	154
09505250	Red Tank Draw near Rimrock	10-19-72	1500	1,060	373	1,070
		04-03-73	1605	52	10	1.4

Table 8.--Suspended-sediment data from selected streamflow sites--Continued

Station number	Station name	Date of sample	Time	Instantaneous discharge, in cubic feet per second	Suspended sediment	
					Concentration, in milligrams per liter	Discharge, in tons per day
09505300	Rattlesnake Canyon near Rimrock	04-16-73	1230	78	9	1.9
		11-13-78	1545	17	15	0.69
		12-11-78	1540	3.3	55	0.49
		01-15-79	1445	1.2	6	0.02
		02-12-79	1330	38	9	0.92
		03-13-79	1000	61	5	0.82
		04-16-79	1335	38	3	0.31
343752111473500	Wet Beaver Creek at Rusty Spur Ford near Rimrock	06-21-77	0900	3.5	18	0.17
09505350	Dry Beaver Creek near Rimrock	03-02-78	1730	5,720	1,750	27,000
343428111511600	Beaver Creek above confluence with Verde River at Camp Verde	06-21-77	1530	10	163	4.4
09505550	Verde River below Camp Verde	02-28-78	1630	8,310	3,410	76,500
		03-06-78	1500	8,930	2,250	54,200

Table 8.--Suspended-sediment data from selected streamflow sites--Continued

Station number	Station name	Date of sample	Time	Instantaneous discharge, in cubic feet per second	Suspended sediment	
					Concentration, in milligrams per liter	Discharge, in tons per day
343016111494600	Verde River above West Clear Creek, near Camp Verde	06-21-77	1630	51	74	10
09505800	West Clear Creek near Camp Verde	07-26-72	1400	36	57	5.5
		10-07-72	1815	960	333	863
		04-11-73	1215	1,300	236	828
		04-21-76	1720	526	156	230
		06-21-77	1030	14	16	0.60
		07-26-79	1400	25	57	3.8
09506000	Verde River near Camp Verde	06-22-77	1200	53	86	12
		10-10-78	1410	99	26	6.9
		12-12-78	1630	218	38	22
		03-14-79	1000	2,000E	54	292E
		04-17-79	1000	1,500E	27	109E
		05-09-79	1100	153	13	5.4
		06-13-79	1000	95	28	7.2
		07-11-79	----	76	18	3.7
		08-10-79	1400	149	45	18
		09-27-79	1345	93	95	24

E Estimated.

The data available for use in estimating the water budget include records of streamflow, pumpage, and water levels in wells. Investigations of evapotranspiration, seepage, and land use have also provided estimates of flow quantities for use in the water budget. Outflow is discussed first because the outflow quantities are the easiest to estimate, and inflow is based on that estimate and the assumption that the change in storage equals zero.

Outflow

Ground water that leaves the regional aquifer is discharged to streams and springs, lost to evapotranspiration, or withdrawn by wells. Streamflow and spring flow are the largest components of outflow and have remained fairly constant since 1915 north of Clarkdale and since 1935 between Clarkdale and Chasm Creek. Underflow out of the area is assumed to be negligible. No significant gains in base flow in the Verde River were detected south of Beasley Flat.

Gaging-station records and seepage investigations along the Verde River indicate that the river is a gaining stream, although it does contain some short losing reaches. Net base flow leaving the valley is measured at Verde River near Camp Verde gaging station. The annual base flow for the 1977 water year was 80,000 acre-ft (table 9), which is 21,000 acre-ft/yr lower than the average value calculated for the 1934-45 water years of 101,000 acre-ft/yr. The data for water year 1977 were used because this water year is the only complete year of recent base-flow data. The value for the base flow may be anomalous because 1977 was a dry year and more water probably was used for irrigation than was used in 1934-45. The seepage investigation of June 1979 indicates no appreciable gains or losses between the Verde River near Camp Verde gage to the outflow point except the gain from Fossil Springs. The outflow is adjusted for the base flow of Fossil Creek by adding the discharge of Fossil Springs, which averages 43 ft^3/s or 31,150 acre-ft/yr (U.S. Geological Survey, 1979, p. 413) (table 9). Therefore, the total base flow leaving the study area at the outflow point is 111,000 acre-ft/yr (rounded).

Evapotranspiration losses from the regional aquifer were determined using the estimated evapotranspiration figures from Anderson (1976) for the main stem of the Verde River, Oak Creek, Wet Beaver Creek, and West Clear Creek. Calculations (Anderson, 1976) were for particular reaches of the streams and include the transpiration from the riparian zone and the evaporation from soil and open-water surfaces along stream channels. Where a reach did not fall totally within the study area, a proportional amount was determined by the ratio of length of the reach in miles that is in the study area to total length of the reach in miles. The evapotranspiration losses by reach are listed as follows:

Reach or stream	Length of reach, in miles	Evapotranspiration losses, in acre-feet per year
Verde River		
3.4 mi downstream of Sullivan Lake to Paulden gage	6.4	400
Paulden gage to Clarkdale gage	28.2	2,200
Clarkdale gage to Camp Verde	47.1	18,000
Camp Verde to East Verde River	32.1	3,800
Oak Creek	46.9	4,700
Wet Beaver Creek	27.4	3,500
West Clear Creek	32.5	2,400
Total		35,000

Surface water, mainly from the Verde River, is diverted through a system of ditches for irrigation. Unused water returns to the river. In the Verde Valley 7,781 acres is irrigated by surface water (Northern Arizona Council of Governments, 1979, p. 123). The amount of water used per acre depends on soil type, crop type, and the method of irrigation. The Soil Conservation Service (J. E. Alam, oral commun., 1979) estimated consumptive use of water to be 4 acre-ft/acre; therefore, using this estimate, the amount of water used for irrigation is about 31,000 acre-ft/yr (table 9). Surface-water returns from the fields to the river are not common because of the nature of the irrigation systems employed by most of the irrigation ditch users and because most of the crops are close-grown, thereby minimizing overland flow (Northern Arizona Council of Governments, 1979).

Prior to 1950, ground-water use was sparsely scattered in the Verde Valley. During the 1950's, development of ground water for public and domestic use started increasing. Ground-water withdrawal for the upper Verde River area was estimated to be 8,000 acre-ft/yr for 1978 (U.S. Geological Survey, 1980a) (table 9). Ground water is used for domestic and public supplies. Estimates by the Soil Conservation Service (J. E. Alam, oral commun., 1979) indicate that less than 5 percent of the land being irrigated uses ground water as the water supply.

Total annual outflow from the study area is estimated as 185,000 acre-ft. Subtracting Fossil Springs discharge, the total annual outflow at the Verde River near Camp Verde gaging station is about 154,000 acre-ft. This value compares well with the minimum value for total outflow of 150,000 acre-ft/yr estimated by Twenter and Metzger (1963) for the Verde River near Camp Verde station.

Table 9.--Estimated average inflow to and outflow from the regional aquifer including surface-water inflow in acre-feet per year for the upper Verde River area

Inflow	
Infiltration of precipitation and streamflow	169,000
Base flow of Verde River near Paulden	16,000
Total	185,000
Outflow	
Base flow of Verde River near Camp Verde	80,000
Fossil Springs	31,150
Evapotranspiration	35,000
Irrigation, consumptive use	31,000
Ground-water withdrawal	8,000
Total (rounded)	185,000

Inflow

Inflow to the regional aquifer is from infiltration of precipitation and streamflow. Some infiltration occurs throughout the entire study area. The largest amount of infiltration probably occurs in the Plateau uplands where the average annual precipitation is about 20 in. and permeable volcanic rocks and limestone crop out. The average annual precipitation on the upper Verde River area is 16.6 in. or 2.1 million acre-ft.

The amount of infiltration from precipitation and streamflow was estimated by balancing the water budget, assuming equilibrium conditions existed. Surface-water base flow into the area is accounted for by calculating the base flow at the gaging station, Verde River near Paulden. Annual base flow is fairly constant at 16,000 acre-ft (table 9). Sycamore and Oak Creeks where they enter the study area and East Clear Creek where it leaves the study area are ephemeral and have no base flow. Underflow into the area is assumed to be negligible. The only other source of recharge is through infiltration of precipitation, which is estimated to be 169,000 acre-ft/yr (table 9) or 8 percent of the average annual precipitation. This value agrees with the 8-percent recharge calculated by Twenter and Metzger (1963, p. 75).

SUMMARY AND CONSIDERATION OF FUTURE DATA REQUIREMENTS

Future development in the upper Verde River area probably will be dependent on water obtained from units of the regional aquifer. Additional surface-water development is limited owing to existing downstream water rights. Ground water is presently used as the principal source of domestic and public supplies; annual draft on the system is estimated to be 8,000 acre-ft with less than 10 percent used for irrigation. Ground water occurs mainly in the regional aquifer, which includes the alluvium along the Verde River, Verde Formation, Coconino Sandstone, Supai Formation, Naco Formation, Redwall Limestone, Martin Formation, and Tapeats Sandstone. All the units are hydraulically connected. The particular rock unit that produces water is dependent on areal location because some units have been eroded and some are above the water table. Other aquifers that provide local water supplies are the volcanic rocks, granitic rocks, alluvium, Kaibab Limestone, and Toroweap Formation.

In most of the area, ground water is unconfined; however, in parts of the Verde Formation, Supai Formation, and Redwall Limestone, ground water is confined. Some wells that obtain water from the Verde, Supai, and Redwall flow at the land surface near Rimrock, Cornville, Cottonwood, and Page Springs. Depth to water in wells that tap the regional aquifer ranges from 47 ft above the land surface to 917 ft below the land surface but generally is less than 800 ft below the land surface. Well yields range from less than 10 to 1,600 gal/min. The highest yields, those greater than 500 gal/min, occur in the Verde, Redwall, and Coconino and are probably associated with solution features, faulting, or fracturing. Aquifer-test data indicate that the transmissivity of the regional aquifer ranges from 20 to 16,000 ft^2/d. The wide range in values is a result of secondary permeability, which causes the higher values.

Ground water obtained from the regional aquifer throughout most of the area is of acceptable chemical quality for most uses; however, water from the Verde Formation locally exceeds the maximum contaminant levels for drinking water as recommended by the U.S. Environmental Protection Agency and the State of Arizona for dissolved solids, sulfate, arsenic, and fluoride. Water from the Coconino, Supai, Redwall, and Martin generally contains less than 500 mg/L of dissolved solids, mainly calcium, magnesium, and bicarbonate. Ground water changes composition as it flows downgradient through the Verde Formation. North of Cottonwood, the major ions are calcium, magnesium, sodium, and bicarbonate. South of Camp Verde, sodium, magnesium, and sulfate are the major ions. Dissolved-solids concentrations range from 209 to 97,700 mg/L and have a median value of 424 mg/L. The percentage of Verde wells having water with more than 500 mg/L of dissolved solids increases in the downgradient direction and correlates with the presence of evaporite minerals in the Verde Formation. The result is a marked increase in sodium and sulfate from Middle Verde to south of Camp Verde. Ground water in the alluvium along the Verde River south of Camp Verde

also contains large concentrations of dissolved solids, 806 to 3,790 mg/L, which are mainly magnesium, sodium, calcium, and sulfate. Arsenic concentrations range from 1 to 240 μg/L, and those samples that exceed the 50 μg/L maximum contaminant level for arsenic occur from Cornville and Rimrock to Camp Verde. Drill cuttings from the Verde Formation contain from 7 to 88 μg/g of arsenic; the highest values were found associated with clay. Fluoride concentrations in water from nine wells near Middle Verde and Camp Verde exceeded the maximum contaminant level of 1.4 mg/L.

Locally perched water in the volcanic rocks, granitic rocks, and alluvium is the only developed source of water in some parts of the Black Hills and Plateau uplands. Depth to water in wells and well yields depend on location. Perched water generally is acceptable for its uses.

Base flow in the Verde River and its perennial tributaries is maintained by discharge from the regional aquifer. Base flow has remained virtually unchanged since 1915 north of Clarkdale. Since 1935, winter base flow has remained virtually unchanged between Clarkdale and Chasm Creek; whereas, summer base flow decreased, which probably is associated with increased water use by evapotranspiration and irrigation during dryer summers. This change in the system indicates withdrawal of water from the Verde River and not from the aquifer away from the river. Evapotranspiration and irrigation are highest from Clarkdale to the East Verde River. The principal use for surface water is irrigation, for which the water generally is well suited except in Bitter Creek because of mine drainage and in the Camp Verde area where the salinity hazard is medium to high owing to ground-water discharge that increases the dissolved solids in the surface water.

The ground-water system still represents equilibrium conditions. No change in winter base flow and no lasting water-level declines were detected throughout the study area. No significant change in average inflow or aquifer discharge was detected in flow-duration curves. Ground-water use is 4 percent of the inflow to the area. The total base flow that leaves the area as surface water at the outflow point is 111,000 acre-ft/yr. Underflow is negligible into the study area from the Big Chino Valley area and out of the study area near the outflow point.

Demands on ground water with continuing population growth along the Verde River flood plain and along the lower reaches of the tributary streams will ultimately affect the amount of base flow available in the streams for use locally and downstream. As the area is developed and more wells are drilled, the volume of water in the regional aquifer may decrease, and a corresponding decrease in the amount of base flow may result. Land use is changing as farms and ranches are subdivided, and changes in how water is used are closely related. Ground-water development is not evenly distributed over the entire study area but concentrated in the main population centers. Concentration of pumping in these areas could cause local overdrafts in the regional aquifer. Continued monitoring is needed at both the upstream and downstream ends of the Verde Valley to document changes in the surface-water outflow as

development in the valley continues. Operation of the Verde River near Camp Verde gaging station would also provide additional data to help redefine the enveloping base-flow hydrographs. Monitoring is needed in high stress areas for water-level changes in order to understand the effects on the ground-water system. Water-quality monitoring is needed for ground water and surface water to determine effects that may result from further development. The hydraulic interaction between the Verde River, alluvium, and Verde Formation needs to be better understood to determine the effects of continued ground-water development on surface water and whether surface water recharges the ground-water system along the river. Little is known about the water in the alluvium owing to lack of data. Along most of the Verde River, the alluvium is thin and not an important source of ground water. At the south end of the Verde Valley near Camp Verde, the alluvium is an important source of ground water because the water quality is better than water from the Verde Formation. Analysis of streamflow data, the concentration of irrigation occurring on the alluvium particularly south of Camp Verde, and the chemical similarities to water contained in the alluvium and Verde Formation indicate that the alluvium plays an important role in the ground-water system that is not fully understood. Fossil Springs provides about 17 percent of the water leaving the study area but little is known about the origin of this water. Additional sampling and age dating for geochemical modeling might help in understanding this part of the system.

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HYDROLOGIC DATA

Local number: See figure 2 for description of well-numbering and location system. UNSURV, unsurveyed.

Method constructed: A, air rotary; B, bored or augered; C, cable tool; D, dug; H, hydraulic rotary; P, air percussion.

Finish: C, porous concrete; F, gravel with perforated or slotted casing; G, gravel screen; O, open end; P, perforated or slotted; W, walled; X, open hole.

Depth to first opening: Depth in feet below land surface, to top of first perforated interval.

Use of water: C, commercial; H, domestic; I, irrigation; N, industrial; P, public supply; R, recreation; S, stock; T, institution; U, unused.

Depth of well: In feet below land surface

Altitude of land surface: In feet above the National Geodetic Vertical Datum of 1929, determined from U.S. Geological Survey topographic maps.

LOCAL NUMBER	DATE COMPLETED	METHOD CONSTRUCTED	FINISH	CASING DIAMETER (INCHES)	DEPTH TO FIRST OPENING (FEET)	USE OF WATER	DEPTH OF WELL (FEET)	ALTITUDE OF LAND SURFACE (FEET)	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED
A-12-07 32B UNSURV	07/ /1975	P	P	8	72	H	100	3585	92.00	R	07/ /1975
A-12-10 01CAB	01/ /1964	--	--	--	--	U	743	7346	731.00	R	01/04/1964
A-13-04 12AAA	--	--	--	6.62	--	H	--	3070	22.45	SR	12/23/1976
A-13-04 12ADD	--	--	--	6	--	H,S	--	3070	39.94	SR	12/23/1976
A-13-05 05ABC	05/ /1971	--	X	6	25	H	140	3125	60.00	R	05/ /1971
A-13-05 05ADC	1958	C	X	6	32	H	100	3100	48.00	R	1958
A-13-05 05BAD1	03/ /1958	C	X	8	32	H	105	3110	53.00	R	03/ /1958
A-13-05 05BAD2	1951	C	X	8	35	H,I	56	3075	27.00	R	04/ /1976
A-13-05 05BAD3	--	--	--	6	--	U	--	3080	32.15	S	12/01/1976
A-13-05 05BDC	1959	C	P	8	60	P,H	120	3110	54.10	SR	07/15/1959
A-13-05 05BDD	1954	C	--	8	--	H	75	3100	42.00	R	04/29/1959
A-13-05 05CAA1	1954	C	X	8	30	H	109	3095	44.00		1954
A-13-05 05CAA2	01/ /1963	C	--	--	--	H	78	3090	43.00	R	01/ /1963
A-13-05 05CAB1	1958	C	--	6	--	U	100	3100	50.48	S	12/02/1976
A-13-05 05CAB2	03/ /1959	C	X	8	30	H	70	3095	42.61	S	04/29/1959
A-13-05 05CAD	--	--	--	6.50	--	H	--	3090	49.90	S	12/01/1976
A-13-05 05CBB	--	--	--	6	--	U	--	3080	29.00	S	12/02/1976
A-13-05 05DAB1	05/ /1976	C	X	8	43	H	100	3105	45.00	R	05/ /1976
A-13-05 05DAB2	--	--	--	--	--	H	--	3095	45.65	S	12/01/1976
A-13-05 05DAB3	--	--	--	6	--	U	--	3100	48.40	S	12/01/1976
A-13-05 05DAB4	1969	--	--	6	--	H	125	3110	54.15	S	12/01/1976
A-13-05 05DAC1	02/26/1976	C	X	6	45	U	90	3090	43.00	R	02/26/1976
A-13-05 05DAC2	04/ /1963	C	--	6	--	H,I	83	3090	40.00	R	04/ /1963
A-13-05 05DBA	1974	C	X	6	30	P	120	3095	44.45	S	12/01/1976
A-13-05 05DBB	--	C	X	6	48	H	120	3095	45.65	S	01/19/1965
A-13-05 05DCD	07/21/1979	C	X	6	41	H	130	3075	30.00	R	07/21/1979
A-13-05 05DDC	1972	--	--	--	--	--	100	3075	25.00	R	1972
A-13-05 06AAA	03/04/1974	--	P	12	13	P	63	3085	23.26	SR	01/06/1977
A-13-05 06AAB	02/02/1972	--	X	6	34	H	75	3080	30.00	R	02/02/1972
A-13-05 06BAB	--	--	--	6	--	H	65	3095	33.45	S	12/23/1976
A-13-05 06BAD	--	--	--	6	--	U	--	3090	30.10	S	04/11/1977
A-13-05 06BBA	--	--	--	8	--	U	--	3100	39.55	S	12/23/1976
A-13-05 06BBD1	01/18/1974	--	X	8	210	I	235	3110	60.00	R	01/18/1974
A-13-05 06BBD2	06/14/1974	--	X	8	180	I	230	3115	61.88	S	12/23/1976
A-13-05 06CBA	--	--	--	6	--	H	80	3090	40.00	R	--
A-13-05 06CBC1	07/16/1974	C	X	9	110	U	200	3060	33.87	S	12/23/1976
A-13-05 06CBC2	03/ /1977	C	P	6.50	56	I	64	3095	42.90	S	04/12/1977
A-13-05 06DAA1	--	--	--	6	--	H	60	3060	29.01	S	12/02/1976
A-13-05 06DAA2	02/09/1973	C	X	6	35	H	65	3060	30.00	R	02/09/1973
A-13-05 06DBC	06/01/1979	C	--	6	--	I	140	3055	25.00	R	06/01/1979
A-13-05 06DBD	05/10/1979	C	--	6	--	U	48	3060	28.00	R	05/10/1979
A-13-05 06DDB	--	--	--	6	--	U	--	3065	19.97	S	12/09/1976
A-13-05 06DDC	09/27/1979	C	X	6	133	H	160	3070	25.00	T	03/20/1980
A-13-05 07ADA	12/ /1975	C	P	6	20	H	35	3050	12.00	R	12/ /1975
A-13-05 07ADB	--	--	--	6	--	U	--	3050	11.57	S	12/09/1976
A-13-05 07ADD	01/16/1974	C	P	10.62	2	H	37	3050	20.00	R	01/16/1974
A-13-05 07BAB	05/02/1973	C	P	6.62	5	H	47	3045	20.00	R	05/02/1973
A-13-05 07BCB	1967	--	--	6	--	I,S	50	3050	16.00	S	12/23/1976
A-13-05 07BDA	11/ /1956	C	X	6	19	H	31	3045	17.37	S	12/09/1976
A-13-05 07DCA	08/21/1975	--	X	--	32	H	40	3060	18.00	R	08/21/1975
A-13-05 08AAB	--	--	--	6	--	U	--	3075	25.29	S	12/01/1976
A-13-05 08BCC	05/04/1974	C	P	8.62	13	H	43	3045	12.00	R	05/04/1974
A-13-05 08BDA1	02/ /1963	C	X	6	40	H	50	3050	3.60	S	12/02/1976
A-13-05 08BDA2	10/ /1973	C	P	6	21	U	35	3050	3.40	S	12/02/1976
A-13-05 08BDC	09/08/1971	--	--	6	--	H	30	3050	11.97	S	12/09/1976
A-13-05 08CAA1	12/12/1978	C	P	12	15	I	37	3045	8.00	R	12/12/1978
A-13-05 08CAA2	12/14/1978	C	P	12	21	I	40	3045	13.00	R	12/14/1978
A-13-05 08CDB	08/08/1972	C	O	6	--	H	48	3040	22.32	S	12/16/1976
A-13-05 08CDC	08/14/1976	C	P	6.62	53	H	70	3070	50.00	R	08/14/1976
A-13-05 08DAB3	--	D	--	48	--	H	30	3065	22.35	S	12/09/1976
A-13-05 09BB	1913	--	--	--	--	--	1225	3090	--		--
A-13-05 09CAB	08/16/1970	C	X	12	20	I	175	3090	55.00	R	08/16/1970
A-13-05 09CDC	08/07/1973	--	X	12	28	I	100	3055	17.26	S	12/07/1976
A-13-05 09DBA	--	--	--	6	--	H	--	3190	138.30	S	12/07/1976
A-13-05 09DBB	08/23/1979	C	X	6.50	77	H	210	3190	134.42	T	03/20/1980
A-13-05 10BCA	1913	--	--	8	--	--	1625	3200	--		--
A-13-05 11DAB	1957	--	X	6	20	U	150	3210	95.25	S	12/08/1976
A-13-05 11DCB	--	--	--	--	--	--	--	3145	--		--
A-13-05 12CCA	01/03/1973	--	X	8	35	H	55	3200	20.00	R	01/03/1973
A-13-05 12CCC1	1960	--	P	6	--	H	60	3170	35.00	R	1960
A-13-05 12CCC2	1963	C	P	6	22	H	50	3180	18.63	S	12/08/1976
A-13-05 12CCD	07/04/1974	C	X	8.62	45	--	104	3180	8.00	R	07/04/1974
A-13-05 13BAC1	--	--	--	6	--	H	--	3195	93.30	S	12/08/1976
A-13-05 13BAC2	1965	--	P	16	--	P	165	3190	82.10	S	12/09/1976
A-13-05 13BBD	1972	C	P	8	--	P	65	3170	11.70	S	12/09/1976
A-13-05 13BDA	--	--	--	6	--	U	--	3190	12.55	S	03/31/1977
A-13-05 13CBA	--	--	--	6	--	U	--	3175	--		--
A-13-05 13DBC	--	--	--	8	--	U	175	3200	95.74	S	12/08/1976
A-13-05 14ABD	07/12/1974	C	X	6.62	73	--	95	3135	26.00	R	07/12/1974
A-13-05 15AAA	03/ /1959	C	X	8	60	--	132	3130	42.60	S	04/08/1959

Water level: In feet below land surface. Method of measurement (first letter)—G, pressure gage; L, geophysical logs; R, reported; S, steel tape; T, electric tape. Site status (second letter)—D, dry; F, flowing; P, pumping; R, recently pumped; S, nearby pumping; X, surface-water effects.

Discharge: B, bailer; C, current meter; E, estimated; M, totaling meter; O, orifice; P, pilot-tub meter; R, reported; U, venturi; V, volumetric.

Types of logs available: C, caliper; D, drillers; E, electric; G, geologist; I, induction; J, gamma ray; L, laterlog; M, micr213log; N, neutron; T, temperature; U, gamma-gamma; Z, other.
Principal aquifer: 111ALVM, alluvium; 120VLCC, volcanic rocks; 121VERD, Verde Formation; 310CCNN, Coconino Sandstone; 310 SUPI, Supai Formation; 330RDLL, Redwall Limestone; 341 MRTN, Martin Formation; 400GFCG, granitic gneiss; 400GRNT, granite.
Other data available: QW (water quality): A, physical properties; B, common ions; C, trace elements; I, both common ions and trace elements. WL (water level): A, annual; B, bi-monthly; C, continuous; I, intermittent; S, semiannual.

DISCHARGE (GALLONS PER MINUTE)	DATE DISCHARGE MEASURED	DRAW-DOWN (FEET)	TYPES OF LOGS AVAILABLE	PRINCIPAL AQUIFER	TEMPERATURE (DEGREES °C)	SPECIFIC CONDUCTANCE (UMHOS/CM AT 25° C)	LOCAL NUMBER	OTHER DATA AVAILABLE QW	WL
--	--	--	G	--	--	--	A-12-07 32B UNSURV		
--	--	--	D	--	--	--	A-12-10 01CAB		
--	--	--	--	121VERD	--	2850	A-13-04 12AAA	C	
--	--	--	--	121VERD	20.0	2375	A-13-04 12ADD	I	
30 R	05/ /1971	2	D	121VERD	--	1000	A-13-05 05ABC		
--	--	--	D	121VERD	--	--	A-13-05 05ADC		
--	--	--	D	121VERD	--	--	A-13-05 05BAD1		
--	--	--	--	121VERD	13.0	850	A-13-05 05BAD2	I	
--	--	--	--	121VERD	--	--	A-13-05 05BAD3		
35 R	1958	0	D	121VERD	--	1100	A-13-05 05BDC	C	A
--	--	--	D	121VERD	--	--	A-13-05 05BDD		
--	--	--	D	121VERD	--	--	A-13-05 05CAA1		
30 B	01/ /1963	--	D	121VERD	--	--	A-13-05 05CAA2		
--	--	--	D	121VERD	--	--	A-13-05 05CAB1		
--	--	--	D	121VERD	--	--	A-13-05 05CAB2		
--	--	--	--	121VERD	--	1200	A-13-05 05CAD		
--	--	--	--	121VERD	--	--	A-13-05 05CB9		
20 R	05/ /1976	8	D	121VERD	15.0	1400	A-13-05 05DAB1	C	
--	--	--	--	121VERD	--	--	A-13-05 05DAB2		
--	--	--	--	121VERD	--	--	A-13-05 05DAB3		
30 R	1969	0	D	121VERD	--	--	A-13-05 05DAB4		
20 R	02/26/1976	--	D	121VERD	--	--	A-13-05 05DAC1		
--	--	--	--	121VERD	--	1500	A-13-05 05DAC2	C	
30 R	1974	0	--	121VERD	--	--	A-13-05 05DBA	I	
--	--	--	--	121VERD	--	--	A-13-05 05DBB		T
20 R	07/21/1978	0	D	121VERD	--	--	A-13-05 05DCD		
--	--	--	--	121VERD	--	--	A-13-05 05DDC		
--	--	--	D	121VERD	18.0	850	A-13-05 06AAA	I	T
36 R	02/02/1972	2	D	121VERD	--	--	A-13-05 06AAB		
--	--	--	--	--	--	--	A-13-05 06BAB		
--	--	--	--	--	--	--	A-13-05 06BAD		
--	--	--	--	--	--	--	A-13-05 06BBA		
20 R	01/18/1974	0	D	121VERD	24.0	1950	A-13-05 06BBD1	B	
30 R	06/14/1974	40	D	121VERD	--	5900	A-13-05 06BBD2		
--	--	--	--	--	--	18000	A-13-05 06CBA		
30 R	07/16/1974	35	D	121VERD	--	--	A-13-05 06CBC1		
--	--	--	D	111ALVM	20.0	5600	A-13-05 06CBC2	I	
--	--	--	--	121VERD	--	1900	A-13-05 06DAA1	B	
35 R	02/09/1973	0	D	121VERD	--	--	A-13-05 06DAA2		
15 R	06/01/1978	15	D	121VERD	--	--	A-13-05 06DBC		
10 R	05/10/1979	7	D	121VERD	--	--	A-13-05 06DBD		
--	--	--	--	--	--	--	A-13-05 06DDB		
--	--	--	D	121VERD	--	--	A-13-05 06DDC		
30 R	12/ /1975	4	D	111ALVM	--	1100	A-13-05 07ADA		
--	--	--	--	--	--	--	A-13-05 07ADB		
30 R	01/16/1974	0	D	111ALVM	--	--	A-13-05 07ADD		
20 R	05/02/1973	0	D	111ALVM	--	--	A-13-05 07BAB		
--	--	--	--	111ALVM	19.0	1900	A-13-05 07BCB		
--	--	--	D	111ALVM	18.0	1200	A-13-05 07BDA	I	
12 R	08/21/1975	8	D	111ALVM	--	--	A-13-05 07DCA		
--	--	--	--	121VERD	--	--	A-13-05 08AAB		
--	--	--	D	111ALVM	--	--	A-13-05 08BCC		
30 R	02/ /1963	--	D	121VERD	--	1600	A-13-05 08BDA1	I	
40 R	10/ /1973	--	--	111ALVM	--	--	A-13-05 08BDA2		
--	--	--	D	111ALVM	--	--	A-13-05 08BDC		
80 R	12/12/1978	9	D	111ALVM	--	--	A-13-05 08CAA1		
80 R	12/14/1978	0	D	111ALVM	--	--	A-13-05 08CAA2		
25 R	08/08/1972	3	D	111ALVM	--	1350	A-13-05 08CDB		
20 R	08/14/1976	0	D	111ALVM	--	--	A-13-05 08CDC		
--	--	--	--	--	--	--	A-13-05 08DAB3		
--	--	--	D	121VERD	--	--	A-13-05 09BB		
225 V	12/07/1976	--	D	121VERD	20.0	2400	A-13-05 09CAB		
75 R	08/07/1973	3	D	121VERD	--	--	A-13-05 09CDC		
--	--	--	--	121VERD	--	--	A-13-05 09DBA		
20 R	08/23/1979	15	D	121VERD	21.0	1260	A-13-05 09DBB		
--	--	--	D	121VERD	--	--	A-13-05 10BCA		
--	--	--	D	121VERD	--	--	A-13-05 11DAB		
--	--	--	--	--	--	--	A-13-05 11DCB		
24 B	01/03/1973	25	D	121VERD	--	1250	A-13-05 12CCA	I	
--	--	--	--	--	--	890	A-13-05 12CCC1		
15 R	1963	--	D	121VERD	--	1750	A-13-05 12CCC2		
--	--	--	D	121VERD	--	--	A-13-05 12CCD		
--	--	--	--	--	--	--	A-13-05 13BAC1		
55 R	12/09/1976	--	--	--	--	580	A-13-05 13BAC2		
200 R	12/08/1976	--	--	--	--	490	A-13-05 13BBD		
--	--	--	--	111ALVM	--	--	A-13-05 13BDA		
--	--	--	--	--	--	--	A-13-05 13CBA		
25 R	12/08/1976	--	--	121VERD	--	--	A-13-05 13DBC	C	T
--	--	--	D	121VERD	--	--	A-13-05 14ABD		
--	--	--	D	121VERD	18.0	25000	A-13-05 15AAA	B	A

LOCAL NUMBER	DATE COMPLETED	METHOD CONST-RUCTED	FINISH	CASING DIAM-ETER (INCHES)	DEPTH TO FIRST OPENING (FEET)	USE OF WATER	DEPTH OF WELL (FEET)	ALTITUDE OF LAND SURFACE (FEET)	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED
A-13-05 15ADB	06/ /1974	--	--	6	--	H	22	3100	7.55	S	12/08/1976
A-13-05 15BAC	--	--	--	8	--	H	--	3105	35.00	S	12/02/1976
A-13-05 15BDA	10/31/1973	--	X	6	35	H	45	3090	20.00	R	11/05/1975
A-13-05 15BDB1	1950	--	X	8	30	T	45	3085	15.00	R	1976
A-13-05 15BDB2	--	--	P	8	--	P,H	95	3080	15.00	R	1976
A-13-05 15BDB3	1969	--	P	8	--	T	90	3090	55.00	R	1976
A-13-05 16AAA	03/19/1976	--	X	6	46	S,I	60	3080	39.94	S	12/02/1976
A-13-05 16ACA	08/17/1973	--	X	12	48	T	110	3050	15.29	S	12/07/1976
A-13-05 16ACB1	07/15/1976	--	X	13	13	U	100	3055	31.70	S	12/07/1976
A-13-05 16ACB2	09/02/1976	--	--	10	--	T	66	3050	15.00	R	09/02/1976
A-13-05 16BAD	12/ /1969	--	X	6	43	H	60	3060	27.46	S	12/07/1976
A-13-05 17AAD	1960	C	--	6	--	H	30	3045	17.98	S	12/16/1976
A-13-05 17ABB1	--	--	--	6	--	H	57	3070	36.77	S	12/16/1976
A-13-05 17ABB2	--	--	--	6	--	H	72	3065	32.75	S	12/16/1976
A-13-05 17ABB3	10/ /1962	C	--	6	--	H	49	3060	41.50	S	01/19/1965
A-13-05 17ABC	--	--	--	6	--	U	--	3080	53.52	S	12/16/1976
A-13-05 17CAA	09/03/1973	--	P	6	55	H	60	3060	33.85	S	12/16/1976
A-13-05 17CAD	1951	--	--	9	--	P	125	3090	67.20	S	12/16/1976
A-13-05 20AAB	--	--	--	6	--	H	120	3035	23.51	S	12/16/1976
A-13-05 20BAB	1976	--	--	--	--	--	200	3180	190.00	R	1976
A-13-05 21ABA	1975	C	--	6	--	H	41	3030	14.89	S	12/07/1976
A-13-05 21BCB	--	--	--	48	--	T	--	3030	25.10	S	12/16/1976
A-13-05 21CDA	10/20/1973	--	--	8.62	--	H	70	3025	18.00	R	10/20/1973
A-13-05 21CDD	10/21/1973	--	X	10.75	85	S,I	240	3030	35.00	R	11/15/1973
A-13-05 26AAA	12/31/1969	--	X	8.62	18	S	560	3365	389.72	S	02/02/1977
A-13-05 27CAB1	06/ /1964	C	X	6	40	H	50	3020	24.00	R	06/ /1964
A-13-05 27CAB2	1920	--	--	8	--	U	230	3020	73.40	S	02/02/1977
A-13-05 27CBC	1968	--	--	6	--	H,S	50	3010	22.58	S	12/21/1976
A-13-05 27DBC1	--	--	--	12	--	C	--	3000	82.70	T	02/02/1977
A-13-05 27DBC2	--	--	--	9	--	C	--	3000	82.00	S	02/02/1977
A-13-05 27DCA2	--	--	--	6	--	C	--	2990		P	--
A-13-05 27DCB1	03/06/1973	C	X	6	40	C,I	140	2990	49.60	SS	02/02/1977
A-13-05 27DCB2	--	--	--	8.62	--	C,I	--	2990		P	--
A-13-05 27DCB3	--	--	--	8.62	--	C	--	2990	46.60	SP	02/02/1977
A-13-05 27DCD1	--	--	--	8	--	I,C	--	2985	48.30	S	02/02/1977
A-13-05 27DCD2	--	--	--	6	--	H	--	2985	--		--
A-13-05 27DDC	--	--	--	6	--	T	--	2970	28.85	S	02/02/1977
A-13-05 28AAA	--	D	--	36	--	T	--	2990	9.40	S	12/21/1976
A-13-05 28ACD	1956	C	--	8	--	H	--	3020	35.85	S	12/21/1976
A-13-05 28BCD	1960	C	--	--	--	--	700	3100	95.00	R	1960
A-13-05 28DAC	--	--	--	6	--	H,I	--	3020	26.57	SR	12/21/1976
A-13-05 28DBA	04/ /1972	C	P	6	--	H	55	3030	40.00	R	04/ /1972
A-13-05 33AAB	11/26/1979	C	X	8	85	U	230	3055	127.50	S	03/20/1980
A-13-06 11BAB	--	--	--	6.62	--	U	--	3670	35.10	S	03/10/1978
A-13-06 13BCD	--	--	--	8.62	--	U	--	4500	232.60	T	02/15/1978
A-13-06 23BBC	03/28/1962	C	P	6	290	S	600	4420	346.90	T	09/22/1966
A-13-06 29DBB	01/14/1939	--	--	6	--	S	328	3492	--		--
A-13-07 14BAB	08/29/1962	C	X	6	110	S	800	5955	752.00	S	09/22/1966
A-13-10 06ADA	08/14/1964	C	--	--	--	U	627	6865	468.20	S	07/13/1966
A-13-10 06DAA	08/08/1964	C	--	--	--	H	567	6865	346.80	S	07/13/1966
A-13-10 24AAD	09/30/1963	C	--	--	--	U	560	7182	456.00	R	09/30/1963
A-13-10 24DCC	10/08/1963	--	--	--	--	U	658	7276	447.00	R	10/08/1963
A-13-10 25CAA	10/25/1963	--	--	--	--	U	726	7334	427.00	R	06/10/1964
A-13-10 36BCD	11/29/1963	--	--	--	--	U	620	7230		D	11/29/1963
A-13-10 36CCC	12/17/1963	--	--	--	--	U	637	7244	588.00	R	12/17/1963
A-13-11 18CBA	09/ /1963	C	--	--	--	U	435	7061		D	--
A-14-03 17DDD1	06/ /1958	--	X	8	16	H	50	4995	28.00	R	06/ /1958
A-14-03 17DDD2	06/ /1958	--	X	8.62	--	H	78	5000	16.80	T	03/16/1978
A-14-03 21ABB	02/09/1977	C	X	8.62	70	H	72	4940	15.30	T	03/16/1978
A-14-03 21ADA1	1960	--	--	--	--	H	45	4810	35.00	R	1977
A-14-03 21ADA2	1970	--	--	--	--	H,S,T	150	4830	35.00	R	1977
A-14-03 21BAD	02/18/1977	--	X	8.62	37	H	60	4910	11.90	T	03/16/1978
A-14-04 02CBA	--	--	--	--	--	H	85	3180	41.80	S	04/12/1977
A-14-04 02CCD	--	--	--	8	--	U	--	3155	22.95	S	03/30/1977
A-14-04 02DCA	--	--	--	7	--	--	90	3180	43.45	S	04/12/1977
A-14-04 02DDC	07/ /1969	C	--	--	--	H	200	3260	146.70	S	04/12/1977
A-14-04 03ACB	1961	--	--	6	--	H	--	3175	15.00	S	04/13/1977
A-14-04 03ADC	--	--	--	--	--	H	125	3170	45.00	R	1977
A-14-04 03BAA	--	--	--	--	--	H	137	3210	80.00	R	--
A-14-04 03BAB1	--	--	--	6	--	U	--	3210	71.80	S	04/13/1977
A-14-04 03BAB2	08/30/1979	C	X	6	40	U	140	3210	63.00	R	08/30/1979
A-14-04 03BAC4	--	--	--	7	--	U	--	3190	46.85	S	04/13/1977
A-14-04 03BAD	09/04/1972	--	X	6.50	40	H	155	3190	47.70	S	04/12/1977
A-14-04 03BBA1	--	--	--	6	--	--	--	3200	--		--
A-14-04 03BBA2	--	--	--	6.50	--	U	--	3205	64.10	S	04/13/1977
A-14-04 03BBC	08/11/1979	C	X	6	57	H	125	3195	63.00	R	08/11/1979
A-14-04 03BBD1	02/28/1974	--	X	6	40	H	150	3190	80.00	R	02/28/1974
A-14-04 03BCD	--	--	--	48	--	H	--	3170	23.60	S	04/13/1977
A-14-04 03DBC1	07/06/1974	C	X	6	45	H	75	3160	12.00	R	07/06/1974
A-14-04 03DCB	11/30/1976	C	X	6	36	H	175	3165	56.00	R	11/30/1976

DISCHARGE (GALLONS PER MINUTE)	DATE DISCHARGE MEASURED	DRAW-DOWN (FEET)	TYPES OF LOGS AVAILABLE	PRINCIPAL AQUIFER	TEMPERATURE (DEGREES °C)	SPECIFIC CONDUCTANCE (UMHOS/CM AT 25° C)	LOCAL NUMBER	OTHER DATA AVAILABLE GW	WL
--	--	--	--	--	--	470	A-13-05 15ADB		
--	--	--	--	--	--	850	A-13-05 15BAC		
30 B	11/05/1973	5	D	121VERD	--	--	A-13-05 15BDA		
--	--	--	--	121VERD	16.0	640	A-13-05 15BDB1	1	
100 R	1976	0	--	121VERD	--	--	A-13-05 15BDB2		
--	--	--	--	--	17.0	2150	A-13-05 15BDB3		
--	--	--	D	111ALVM	--	--	A-13-05 16AAA		
75 B	08/17/1973	5	D	111ALVM	17.0	3000	A-13-05 16ACA		
100 R	07/15/1976	--	D	111ALVM	--	--	A-13-05 16ACB1		
300 R	09/02/1976	10	D	111ALVM	--	--	A-13-05 16ACB2		
30 B	12/ /1969	35	D	111ALVM	18.0	1900	A-13-05 16BAD	I	
--	--	--	--	--	--	--	A-13-05 17AAD		
--	--	--	--	--	--	--	A-13-05 17ABB1		
--	--	--	--	--	18.5	800	A-13-05 17ABB2	1	
--	--	--	--	--	--	--	A-13-05 17ABB3		I
--	--	--	--	--	--	--	A-13-05 17ABC		
25 B	09/05/1973	0	D	111ALVM	--	2600	A-13-05 17CAA	I	
--	--	--	--	--	--	--	A-13-05 17CAD		
--	--	--	--	--	--	--	A-13-05 20AAB		
--	--	--	D	121VERD	--	--	A-13-05 20BAB		
--	--	--	--	--	--	540	A-13-05 21ABA		
--	--	--	--	111ALVM	--	--	A-13-05 21BCB		
36 B	10/20/1973	0	D	111ALVM	--	--	A-13-05 21CDA		
36 B	11/15/1973	--	D	121VERD	--	--	A-13-05 21CDD		
12 B	12/31/1969	10	D	121VERD	--	--	A-13-05 26AAA		
15 B	06/ /1964	0	D	111ALVM	--	--	A-13-05 27CAB1		
--	--	--	--	121VERD	--	--	A-13-05 27CAB2		
--	--	--	--	111ALVM	--	870	A-13-05 27CBC		
--	--	--	--	--	--	--	A-13-05 27DBC1		
--	--	--	--	--	--	--	A-13-05 27DBC2		
--	--	--	--	--	19.0	650	A-13-05 27DCA2		
20 B	03/06/1973	45	D	121VERD	19.0	1200	A-13-05 27DCB1	1	
--	--	--	--	--	--	--	A-13-05 27DCB2		
--	--	--	--	--	--	--	A-13-05 27DCB3		
--	--	--	--	--	--	--	A-13-05 27DCD1		
--	--	--	--	--	--	--	A-13-05 27DCD2		
--	--	--	--	--	--	--	A-13-05 27DDC		
--	--	--	--	111ALVM	--	--	A-13-05 28AAA		
--	--	--	--	--	--	560	A-13-05 28ACD		
--	--	--	G	121VERD	--	--	A-13-05 28BCD		
--	--	--	--	111ALVM	--	790	A-13-05 28DAC		
35 B	04/ /1972	0	D	111ALVM	--	950	A-13-05 28DBA		
20 B	11/26/1979	13	D	121VERD	--	--	A-13-05 33AAB		
--	--	--	--	--	--	--	A-13-06 11BAB		
--	--	--	--	--	--	--	A-13-06 13BCD		
0.8 B	03/28/1962	--	D	120VLCC	--	--	A-13-06 23BBC	B	
--	--	--	--	120VLCC	25.0	400	A-13-06 29DBB	I	
--	--	--	D	120VLCC	--	--	A-13-07 14BAB	B	
--	--	--	D	310CCNN	--	--	A-13-10 06ADA		A
--	--	--	D	310CCNN	--	--	A-13-10 06DAA		
--	--	--	D	310CCNN	--	--	A-13-10 24AAD		
--	--	--	D	310CCNN	--	--	A-13-10 24DCC		
395 R	06/10/1964	31	D	310CCNN	--	--	A-13-10 25CAA		
--	--	--	D	--	--	--	A-13-10 36BCD		
10 R	12/17/1963	--	D	310CCNN	--	--	A-13-10 36CCC		
--	--	--	D	--	--	--	A-13-11 18CBA		
--	--	--	D	111ALVM	--	700	A-14-03 17DDD1	B	
--	--	--	D	111ALVM	--	--	A-14-03 17DDD2		
--	--	--	D	111ALVM	--	300	A-14-03 21ABB		
--	--	--	--	--	--	--	A-14-03 21ADA1		
--	--	--	--	111ALVM	--	--	A-14-03 21ADA2		
--	--	--	D	400GRNT	16.0	580	A-14-03 21BAD	I	
--	--	--	--	121VERD	20.0	700	A-14-04 02CBA	C	
--	--	--	--	--	--	--	A-14-04 02CCD		I
--	--	--	--	--	--	610	A-14-04 02DCA		
--	--	--	--	121VERD	16.0	640	A-14-04 02DDC	B	
--	--	--	--	--	--	730	A-14-04 03ACB		
--	--	--	--	--	--	--	A-14-04 03ADC		
--	--	--	--	--	--	--	A-14-04 03BAA		
--	--	--	--	121VERD	--	2400	A-14-04 03BAB1	C	
25 B	08/30/1979	7	D	121VERD	--	--	A-14-04 03BAB2		
--	--	--	--	--	--	--	A-14-04 03BAC4		
--	--	--	D	121VERD	--	--	A-14-04 03BAD		
--	--	--	--	--	--	1500	A-14-04 03BBA1		
--	--	--	--	--	--	--	A-14-04 03BBA2		
20 B	08/11/1979	2	D	121VERD	--	--	A-14-04 03BBC		
--	--	--	D	121VERD	--	625	A-14-04 03BBD1	C	
--	--	--	--	--	--	700	A-14-04 03BCD	C	
--	--	--	D	121VERD	17.0	900	A-14-04 03DBC1	I	
15 B	11/30/1976	14	D	121VERD	--	--	A-14-04 03DCB		

LOCAL NUMBER	DATE COMPLETED	METHOD CONST-RUCTED	FINISH	CASING DIAM-ETER (INCHES)	DEPTH TO FIRST OPENING (FEET)	USE OF WATER	DEPTH OF WELL (FEET)	ALTITUDE OF LAND SURFACE (FEET)	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED
A-14-04 04AAB	--	--	--	9	--	H	--	3200	66.00	S	06/09/1977
A-14-04 04DCC	--	--	--	8	--	U	--	3195	59.94	S	03/30/1977
A-14-04 09AAA	07/ /1955	--	X	14	165	I	600	3175	42.00	P	07/ /1955
A-14-04 10CDB	--	--	--	6	--	S	270	3280	--		--
A-14-04 11AAC	05/ /1964	C	X	6	20	P	220	3250	133.90	S	04/12/1977
A-14-04 11ADD	--	--	--	8	--	H,I	--	3210	107.50	SR	06/07/1977
A-14-04 11BBA	07/ /1955	--	X	14	165	I	800	3155	35.00	R	07/ /1955
A-14-04 11DAA1	06/22/1973	C	X	6	33	H	133	3200	86.55	S	06/07/1977
A-14-04 11DAA2	09/20/1974	--	X	6.62	50	P	185	3190	90.50	SR	04/12/1977
A-14-04 11DAC	01/27/1975	--	X	--	51	P	130	3160	80.00	R	01/27/1975
A-14-04 11DBA1	--	--	--	--	--	P	--	3165	--		--
A-14-04 11DBA2	--	--	--	--	--	U	--	3155	--		--
A-14-04 11DDA	--	--	--	6	--	H	--	3150	72.30	S	04/13/1977
A-14-04 12CDC	1968	--	--	9	--	H	86	3140	55.85	S	04/12/1977
A-14-04 13BAB	09/19/1975	--	X	6.50	80	H	100	3120	17.35	S	04/12/1977
A-14-04 13BBA	05/06/1961	--	X	6	52	P	96	3125	38.60	S	04/11/1977
A-14-04 13BCA1	--	--	--	--	--	H	120	3130	--		--
A-14-04 13BCA2	05/05/1979	C	X	8	39	I	100	3130	26.00	R	05/05/1979
A-14-04 13BDA	10/31/1979	C	X	6	29	H	100	3120	30.00	R	10/31/1979
A-14-04 13BDB1	01/09/1967	--	X	8	45	U	100	3125	17.35	S	04/11/1977
A-14-04 13BDB2	02/17/1976	C	X	6.62	22	H	65	3125	19.00	R	02/17/1976
A-14-04 13BDC	09/22/1972	--	X	6	22	H	142	3125	--		--
A-14-04 13BDD1	07/18/1973	C	X	6	25	H	90	3130	36.00	R	07/18/1973
A-14-04 13BDD2	--	--	--	--	--	U	--	3125	34.60	S	03/31/1977
A-14-04 13BDD3	03/09/1977	C	X	6	14	H,I	115	3130	25.00	R	03/09/1977
A-14-04 13CAA	07/24/1973	--	X	6.62	37	H	100	3125	30.00	R	07/24/1973
A-14-04 13CDA	12/17/1971	C	X	6	30	P	100	3110	12.00	R	12/17/1971
A-14-04 13CDD	12/01/1971	C	X	6	32	P	100	3110	8.10	S	04/06/1977
A-14-04 13DAB1	10/21/1976	A	X	--	--	H	200	3200	100.00	R	10/21/1976
A-14-04 13DAB2	10/20/1976	A	X	--	--	--	200	3200	100.00	R	10/20/1976
A-14-04 13DAB3	09/12/1970	A	X	6.50	112	U	202	3200	104.20	S	03/29/1977
A-14-04 13DAC1	1973	--	--	--	--	H	200	3190	--		--
A-14-04 13DAC2	--	--	--	--	--	H	--	3200	--		--
A-14-04 13DBA1	1970	--	--	6	--	H	183	3200	--		--
A-14-04 13DBA2	02/04/1975	A	X	5.50	80	--	200	3200	100.00	R	02/04/1975
A-14-04 13DCD1	10/09/1972	--	X	6	24	H	150	3160	55.00	R	10/09/1972
A-14-04 13DCD2	04/11/1974	--	X	6	23	U	150	3140	24.00	R	04/11/1974
A-14-04 13DCD3	1965	C	X	6	--	H	--	3120	15.00	R	1977
A-14-04 14ACC	--	--	--	6	--	H	--	3150	42.00	S	03/30/1977
A-14-04 14ADC1	1957	--	X	6.50	97	U	180	3150	42.55	S	03/31/1977
A-14-04 14ADC2	10/31/1977	C	--	5	203	H	280	3140	43.00	R	01/06/1979
A-14-04 14CAA	01/25/1973	--	X	6	181	U	190	3180	56.00	S	03/30/1977
A-14-04 14DAD	06/13/1974	--	X	6	23	H	120	3145	35.75	S	03/30/1977
A-14-04 14DBA	09/13/1979	C	X	6	116	H	220	3150	50.00	R	09/13/1979
A-14-04 14DBB	1948	--	--	6	--	H,S	200	3180	44.00	S	03/30/1977
A-14-04 14DBC1	1969	C	X	6	160	H	285	3180	51.00	R	1969
A-14-04 14DBC2	03/31/1975	--	X	8	147	I	185	3180	50.00	R	03/31/1975
A-14-04 14DBD1	10/20/1976	C	X	6	124	H,I	183	3150	41.45	S	03/30/1977
A-14-04 14DBD2	04/01/1977	C	X	6.50	115	H,I	202	3150	20.55	SR	04/07/1977
A-14-04 14DCB1	10/28/1974	C	X	6.50	167	H	235	3180	56.30	S	04/06/1977
A-14-04 14DCB2	--	--	--	6	--	U	--	3180	38.50	S	03/30/1977
A-14-04 15BCC	07/13/1972	--	F	6.62	130	U	210	3360	89.00	S	02/15/1978
A-14-04 23AAA	--	--	--	6	--	U	--	3135	23.60	S	02/02/1977
A-14-04 24ABC	03/ /1967	--	--	6	--	H	85	3100	14.40	S	03/30/1977
A-14-04 24ACC1	10/24/1973	--	P	6	--	H	43	3100	14.00	S	03/30/1977
A-14-04 24ACC2	10/13/1972	C	O	6	--	H	41	3100	13.00	R	10/13/1972
A-14-04 24BBA	03/15/1971	--	P	8.62	--	P	45	3115	14.50	S	04/11/1977
A-14-04 24DAA	1965	--	--	6.50	--	H	80	3115	31.40	S	04/07/1977
A-14-04 25BAB	--	--	--	8	--	U	--	3110	36.25	S	03/31/1977
A-14-04 36DDB	03/03/1971	C	X	8.62	295	--	330	3195	170.00	R	03/03/1971
A-14-05 01AAD	1966	--	--	4.50	--	P	402	3715	241.00	R	1966
A-14-05 01BBC1	05/01/1972	C	X	6.62	75	H	200	3420		F	01/24/1978
A-14-05 01BBC2	01/16/1978	C	X	6	49	H	240	3420		F	01/24/1978
A-14-05 01BCD	1968	--	P	14	180	P	350	3475		F	02/09/1978
A-14-05 01CBB	10/08/1976	--	X	6	53	I	222	3415		F	02/09/1978
A-14-05 02AAD	07/13/1979	C	X	6	55	U	308	3425		F	07/13/1979
A-14-05 02ADA	05/07/1979	C	X	6	32	H	160	3435		F	05/07/1979
A-14-05 02BAB1	01/04/1972	C	X	8	101	H	352	3460		F	01/24/1978
A-14-05 02BAB2	--	--	--	--	--	I	--	3420		F	05/02/1979
A-14-05 02BAD	08/ /1970	C	X	10	116	P	525	3520	35.00	R	08/ /1970
A-14-05 02BBA	1964	C	X	6	70	P	250	3445		F	1964
A-14-05 02CAC	1965	C	--	6.50	--	H	280	3445		F	02/09/1978
A-14-05 02CBC1	10/23/1972	C	X	6	60	H	325	3480	70.00	R	02/09/1978
A-14-05 02CBC2	01/19/1977	C	X	8	10	H	310	3480	170.00	R	01/19/1977
A-14-05 02CCD	06/13/1979	C	X	6	38	H,I	150	3380	35.00	R	06/13/1979
A-14-05 02CDA	05/17/1977	C	X	6	59	H,I	196	3380		F	02/09/1978
A-14-05 02CDC	02/16/1977	C	X	6	63	U	282	3390	26.00	S	02/09/1978
A-14-05 02CDD	05/16/1977	C	X	6	59	H	225	3380		F	02/09/1978
A-14-05 03CCC	06/18/1977	C	X	6	8	H,S	300	3485	230.40	S	03/23/1978
A-14-05 04AAA	1959	C	P	6	410	P,H	503	3480	245.60	S	03/23/1978

DISCHARGE (GALLONS PER MINUTE)	DATE DISCHARGE MEASURED	DRAW-DOWN (FEET)	TYPES OF LOGS AVAILABLE	PRINCIPAL AQUIFER	TEMPERATURE (DEGREES°C)	SPECIFIC CONDUCTANCE (UMHOS/CM AT 25° C)	LOCAL NUMBER	OTHER DATA AVAILABLE GW	WL
--	--	--	--	--	--	--	A-14-04 04AAB		
--	--	--	--	--	--	--	A-14-04 04DCC		
1600 R	07/ /1955	9	D	121VERD	--	--	A-14-04 09AAA		
--	--	--	D	121VERD	--	--	A-14-04 10CDB		
--	--	--	D	121VERD	--	--	A-14-04 11AAC		
--	--	--	--	121VERD	--	640	A-14-04 11ADD	C	
1080 R	07/ /1955	91	D	121VERD	--	--	A-14-04 11BBA		
30 B	06/22/1973	0	D	121VERD	--	--	A-14-04 11DAA1		
--	--	--	D	121VERD	--	650	A-14-04 11DAA2	C	
20 B	01/27/1975	25	D	121VERD	--	--	A-14-04 11DAC		
--	--	--	--	121VERD	19.0	670	A-14-04 11DBA1	C	
--	--	--	--	--	--	--	A-14-04 11DBA2		
--	--	--	--	--	--	--	A-14-04 11DDA		
--	--	--	--	121VERD	--	730	A-14-04 12CDC	C	
--	--	--	D	121VERD	--	700	A-14-04 13BAB		
30 B	05/06/1961	--	D	121VERD	--	--	A-14-04 13BBA		
--	--	--	--	121VERD	--	925	A-14-04 13BCA1	C	
20 B	05/05/1979	17	D	121VERD	--	--	A-14-04 13BCA2		
20 B	10/31/1979	23	D	121VERD	--	--	A-14-04 13BDA		
--	--	--	D	121VERD	--	--	A-14-04 13BDB1	I	
30 B	02/17/1976	--	D	121VERD	--	--	A-14-04 13BDB2		
--	--	--	D	121VERD	--	--	A-14-04 13BDC		
15 B	07/18/1973	12	D	121VERD	--	--	A-14-04 13BDD1		
--	--	--	--	--	--	--	A-14-04 13BDD2		
20 B	03/09/1977	35	D	121VERD	--	840	A-14-04 13BDD3	C	
--	--	--	D	121VERD	--	--	A-14-04 13CAA		
--	--	--	D	121VERD	--	--	A-14-04 13CDA		
--	--	--	D	121VERD	--	--	A-14-04 13CDD		
30 B	10/21/1976	--	D	121VERD	--	--	A-14-04 13DAB1		
30 B	10/20/1976	--	D	121VERD	--	--	A-14-04 13DAB2		
30 B	09/12/1970	--	D	121VERD	--	--	A-14-04 13DAB3		I
--	--	--	--	121VERD	--	--	A-14-04 13DAC1		
--	--	--	--	121VERD	--	650	A-14-04 13DAC2	C	
--	--	--	--	121VERD	--	--	A-14-04 13DBA1		
20 B	02/04/1975	--	D	121VERD	--	--	A-14-04 13DBA2		
30 B	10/09/1972	--	D	121VERD	19.0	560	A-14-04 13DCD1		
36 B	04/11/1974	16	D	121VERD	--	--	A-14-04 13DCD2		
--	--	--	--	111ALVM	--	550	A-14-04 13DCD3	B	
--	--	--	--	--	--	2900	A-14-04 14ACC		
--	--	--	D	121VERD	--	--	A-14-04 14ADC1		
20 B	01/06/1979	17	D	121VERD	--	1425	A-14-04 14ADC2	C	
--	--	--	--	121VERD	--	--	A-14-04 14CAA		
36 B	06/13/1974	2	D	121VERD	18.0	1100	A-14-04 14DAD	C	
20 B	09/13/1979	0	D	121VERD	--	--	A-14-04 14DBA		
--	--	--	--	121VERD	19.5	1700	A-14-04 14DBB	B	
--	--	--	--	121VERD	20.0	1900	A-14-04 14DBC1	I	
75 R	06/04/1977	42	D	121VERD	--	--	A-14-04 14DBC2		
15 B	10/20/1976	22	D	121VERD	--	--	A-14-04 14DBD1		
30 E	04/07/1977	126	D	121VERD	18.5	4000	A-14-04 14DBD2		
60 B	10/28/1974	30	D	121VERD	21.0	6000	A-14-04 14DCB1	I	
--	--	--	--	--	--	--	A-14-04 14DCB2		
50 B	07/13/1972	--	D	121VERD	--	--	A-14-04 15BCC		
--	--	--	--	--	--	--	A-14-04 23AAA		
--	--	--	--	--	--	--	A-14-04 24ABC		
--	--	--	D	111ALVM	--	--	A-14-04 24ACC1		
--	--	--	D	111ALVM	--	--	A-14-04 24ACC2		
90 R	03/15/1971	4	D	111ALVM	--	--	A-14-04 24BBA		
--	--	--	--	121VERD	18.0	700	A-14-04 24DAA	I	
--	--	--	--	--	--	--	A-14-04 25BAB		
--	--	--	D	121VERD	--	--	A-14-04 36DDB		
--	--	--	--	121VERD	--	--	A-14-05 01AAD	I	
--	--	--	D	121VERD	17.5	650	A-14-05 01BBC1		
50 R F	01/16/1978	--	D	121VERD	13.5	690	A-14-05 01BBC2	C	
190 R	01/01/1975	30	D	121VERD	--	--	A-14-05 01BCD	I	
--	--	--	D	121VERD	18.0	660	A-14-05 01CBB	I	
80 R F	07/13/1979	--	D	121VERD	--	--	A-14-05 02AAD		
50 R F	05/07/1979	--	D	121VERD	--	730	A-14-05 02ADA	C	
--	--	--	D	121VERD	19.0	650	A-14-05 02BAB1	B	
--	--	--	--	121VERD	20.0	650	A-14-05 02BAB2	C	
100 R	12/ /1974	6	D	121VERD	--	--	A-14-05 02BAD	I	S
--	--	--	--	121VERD	--	--	A-14-05 02BBA	I	
--	--	--	--	121VERD	23.0	675	A-14-05 02CAC	I	
--	--	--	D	121VERD	--	600	A-14-05 02CBC1	C	
--	--	--	D	121VERD	--	--	A-14-05 02CBC2		
20 B	06/13/1979	40	D	121VERD	--	--	A-14-05 02CCD		
30 R F	05/17/1977	--	D	121VERD	--	670	A-14-05 02CDA	C	
20 B	02/16/1977	10	D	121VERD	--	--	A-14-05 02CDC		
--	--	--	D	121VERD	--	--	A-14-05 02CDD		
20 R	06/18/1977	0	D	121VERD	18.5	600	A-14-05 03CCC		
--	--	--	D,G	121VERD	18.0	475	A-14-05 04AAA	I	

LOCAL NUMBER	DATE COMPLETED	METHOD CONST-RUCTED	FINISH	CASING DIAM-ETER (INCHES)	DEPTH TO FIRST OPENING (FEET)	USE OF WATER	DEPTH OF WELL (FEET)	ALTITUDE OF LAND SURFACE (FEET)	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED
A-14-05 17AAC	11/ /1956	C	P	10	80	P	160	3190	63.00	S	11/25/1958
A-14-05 19BAC1	--	--	--	6	--	U	--	3260	--		--
A-14-05 19BAC2	--	--	--	6	--	U	--	3290	197.00	S	03/16/1977
A-14-05 19BCC	07/28/1979	C	X	6	50	H,I	250	3180	100.00	R	07/28/1979
A-14-05 19BCD	07/29/1979	C	X	6	52	H,I	250	3220	160.00	R	07/29/1979
A-14-05 19BDB	11/27/1979	C	X	6	37	U	265	3250	158.00	R	11/27/1979
A-14-05 19CAC	1969	--	--	6.50	--	H	180	3180	96.20	SR	04/07/1977
A-14-05 19CBA	1970	--	--	6.50	--	H	250	3200	119.20	TR	04/07/1977
A-14-05 19CBD2	--	--	--	6.50	--	U	--	3115	30.20	S	04/07/1977
A-14-05 19CDA	08/04/1979	C	X	6	23	U	150	3135	55.00	R	08/04/1979
A-14-05 19DBA1	--	--	--	--	--	P	--	3160	--		--
A-14-05 19DBA2	03/19/1974	--	X	6	35	P	177	3160	70.00	R	03/19/1974
A-14-05 19DBC	--	C	--	6.50	--	U	--	3160	79.55	S	04/07/1977
A-14-05 26DAB	1934	C	X	8	--	U	715	3665	625.00	S	11/21/1979
A-14-05 29WADC	1968	--	--	6	--	H	40	3080	13.00	S	03/16/1977
A-14-05 29WDDA	--	--	--	6	--	H	--	3085	20.60	S	03/16/1977
A-14-05 30AAA	1962	C	X	6	26	H	63	3090	17.70	S	03/16/1977
A-14-05 30ABA1	1965	C	X	6	30	H	61	3100	39.50	S	03/16/1977
A-14-05 30ABA2	08/18/1975	--	X	6	40	H	150	3100	39.85	S	03/16/1977
A-14-05 30DDA	04/10/1975	--	X	6	36	P	110	3090	19.30	S	03/31/1977
A-14-05 31CCA1	--	--	--	6.50	--	H	287	3230	157.30	S	04/06/1977
A-14-05 31CCA2	--	--	--	6.50	--	U	--	3230	160.70	S	04/06/1977
A-14-05 31CDD	1940	--	--	--	--	H	80	3095	20.00	R	--
A-14-05 31DAD	06/26/1975	--	X	6.50	36	H,I	140	3135	--		--
A-14-05 31DBD1	02/14/1977	C	X	6	50	H	201	3200	134.40	SR	03/16/1977
A-14-05 31DBD2	02/ /1977	C	X	6	77	U	205	3205	142.10	S	03/16/1977
A-14-05 31DCB1	1972	--	--	6	--	H	200	3200	153.10	S	03/16/1977
A-14-05 31DCB2	--	--	--	6	--	U	200	3200	--		--
A-14-05 31DDB	1968	--	--	6.50	--	H	175	3210	146.45	S	04/06/1977
A-14-05 32BAD	11/15/1979	C	X	6	43	U	130	3090	16.00	R	11/15/1979
A-14-05 32BBB1	06/29/1971	--	P	10	--	U	70	3095	22.71	S	01/06/1977
A-14-05 32BBB2	--	--	--	6	--	U	--	3100	29.10	S	03/16/1977
A-14-05 32BDC	05/12/1979	C	X	6	23	H	80	3100	14.00	R	05/12/1979
A-14-05 32CBB1	1930	--	X	6	20	U	113	3130	69.00	S	01/06/1977
A-14-05 32CBB2	04/20/1959	C	X	12	20	P	147	3130	70.65	S	03/16/1977
A-14-05 32CCC	--	--	X	6	34	T	75	3085	23.50	S	03/31/1977
A-14-05 32DCC	05/18/1979	C	X	6	57	U	130	3090	29.00	R	05/18/1979
A-14-06 16DBA	--	--	--	--	--	U	--	3950	35.90	T	12/14/1977
A-14-06 26BDB	--	C	X	10	6	U	--	4360		D	--
A-14-10 04A9D	--	D	--	--	--	U	14	6730	7.60	S	07/20/1966
A-14-10 30ACA	1954	--	P	8	--	N	1050	6900	867.00	S	07/13/1966
A-14-10 32DBD	06/ /1963	H	X	14	102	U	600	6855	343.80	S	06/09/1966
A-15-03 01CBD	--	--	--	--	--	P	200	3270	26.00	R	1977
A-15-03 01CCB1	1970	--	--	6.62	--	H	155	3255	25.10	T	08/24/1977
A-15-03 01CCC	1950	--	--	--	--	H	--	3255	19.45	T	08/24/1977
A-15-03 01CCD1	1969	--	--	6.62	--	H	180	3270	36.55	T	08/24/1977
A-15-03 01CCD2	04/04/1978	--	--	6.62	--	H	166	3265	28.60	S	04/19/1978
A-15-03 01DCB	1972	--	--	--	--	H	--	3295	66.75	T	08/24/1977
A-15-03 01DCC	1974	--	--	6	--	H	300	3275	61.80	SR	08/24/1977
A-15-03 01DCD2	1973	--	--	--	--	H	95	3275	48.10	T	08/23/1977
A-15-03 01DDB1	--	--	--	6.62	--	H,I	160	3290	45.00	T	08/23/1977
A-15-03 01DDB2	11/ /1976	--	--	6.62	--	H	175	3295	49.40	T	08/23/1977
A-15-03 01DDB3	1973	--	--	6.62	--	H	--	3310	71.90	T	08/24/1977
A-15-03 01DDC1	1970	--	--	6.62	--	H	--	3285	53.60	T	08/23/1977
A-15-03 01DDC2	1977	--	--	6.62	--	U	--	3280	52.30	T	08/23/1977
A-15-03 02AAB	1968	--	--	6.62	--	H	130	3290	47.00	TR	09/07/1977
A-15-03 02CBB	1957	C	--	8.62	--	C	225	3365	116.85	TR	04/05/1978
A-15-03 02DAA	1962	--	--	--	--	H	120	3255	10.00	P	04/ /1977
A-15-03 02DAB1	--	--	--	6.62	--	H	140	3270	13.35	T	09/08/1977
A-15-03 02DAB2	1974	--	--	6.62	--	H	100	3255	28.00	TR	09/08/1977
A-15-03 02DAC	1973	--	--	6.62	--	H,S	150	3260	25.60	T	09/08/1977
A-15-03 02DAD	--	--	X	6.62	65	H	165	3260	22.30	T	09/08/1977
A-15-03 02DBD	1958	--	--	6	--	P	102	3240	26.60	T	09/08/1977
A-15-03 04DAC	12/15/1972	--	X	12	224	P	740	3565	378.00	S	04/ /1977
A-15-03 05BAA	--	--	--	5.50	--	S	--	3711		F	02/24/1978
A-15-03 05BDB	--	--	--	--	--	S	535	3735		F	02/24/1978
A-15-03 10ABB	--	--	--	--	--	U	--	3460	199.40	T	04/04/1978
A-15-03 10CBB	07/29/1975	C	F	8.62	60	H	390	3640	324.00	SR	04/04/1978
A-15-03 10DCD	06/12/1974	C	X	8.62	56	H	385	3520	309.70	TR	04/04/1978
A-15-03 11AAD	--	--	--	6.62	--	H,S	150	3270	55.80	T	06/24/1977
A-15-03 11ADA	1962	--	--	6.62	--	H	100	3270	12.90	T	08/20/1977
A-15-03 11BAB1	10/12/1971	C	X	8.62	84	T	600	3370	137.40	TR	04/17/1972
A-15-03 11BAB2	11/12/1971	C	X	8.62	80	T	600	3370	144.40	TR	04/05/1978
A-15-03 11BCC	08/ /1971	--	--	8.62	--	P	600	3445	254.45	T	12/20/1977
A-15-03 11DAD	02/06/1974	C	X	6.62	58	H	184	3350	107.90	TR	04/05/1978
A-15-03 12AAA	11/17/1971	C	X	6.62	47	H	150	3275	48.50	T	06/23/1977
A-15-03 12AAB	1974	--	X	6	56	H	156	3275	49.90	T	06/23/1977
A-15-03 12AAD	1957	--	X	8	40	H,I	130	3260	44.35	T	08/23/1977
A-15-03 12ABB	1977	--	--	6.62	--	H	150	3270	36.45	T	08/20/1977
A-15-03 12ACC4	11/19/1973	C	X	6.62	--	H	135	3250	19.85	T	06/16/1977

DISCHARGE (GALLONS PER MINUTE)	DATE DISCHARGE MEASURED	DRAW-DOWN (FEET)	TYPES OF LOGS AVAILABLE	PRINCIPAL AQUIFER	TEMPERATURE (DEGREES °C)	SPECIFIC CONDUCTANCE (UMHOS/CM AT 25° C)	LOCAL NUMBER	OTHER DATA AVAILABLE QW	WL
45 R	11/25/1958	33	D,G	121VERD	--	552	A-14-05 17AAC	I	A
--	--	--	--	121VERD	--	--	A-14-05 19BAC1		
--	--	--	--	121VERD	--	--	A-14-05 19BAC2		
20 B	07/28/1979	0	D	121VERD	--	--	A-14-05 19BCC		
20 B	07/29/1979	0	D	121VERD	--	--	A-14-05 19BCD		
20 B	11/27/1979	--	D	121VERD	--	--	A-14-05 19BDB		
--	--	--	--	121VERD	--	800	A-14-05 19CAC	C	
--	--	--	--	121VERD	19.0	640	A-14-05 19CBA	I	
--	--	--	--	--	--	--	A-14-05 19CBD2		
30 B	08/04/1979	5	D	121VERD	--	--	A-14-05 19CDA		
250 R	--	--	--	121VERD	--	--	A-14-05 19DBA1		
30 B	03/19/1974	0	D	121VERD	--	--	A-14-05 19DBA2		
--	--	--	--	121VERD	--	--	A-14-05 19DBC		
9 B	09/ /1979	--	D	310SUPI	--	--	A-14-05 26DAB		
--	--	--	--	111ALVM	--	--	A-14-05 29WADC		
--	--	--	--	--	--	--	A-14-05 29WDDA		
--	--	--	D	121VERD	--	--	A-14-05 30AAA		
15 B	1965	8	D	121VERD	--	--	A-14-05 30ABA1		
25 B	08/18/1975	35	D	121VERD	--	--	A-14-05 30ABA2		
35 B	04/10/1975	5	D	121VERD	--	--	A-14-05 30DDA		
--	--	--	--	121VERD	22.0	1150	A-14-05 31CCA1	C	
--	--	--	--	121VERD	--	--	A-14-05 31CCA2		
--	--	--	--	121VERD	--	2200	A-14-05 31CDD		
30 B	06/26/1975	--	D	121VERD	25.5	1700	A-14-05 31DAD	B	
15 B	02/14/1977	5	D	121VERD	29.5	1500	A-14-05 31DBD1	I	
15 B	02/ /1977	0	D	121VERD	--	--	A-14-05 31DBD2		
--	--	--	--	121VERD	--	--	A-14-05 31DCB1		
--	--	--	--	--	--	--	A-14-05 31DCB2		
--	--	--	--	121VERD	--	1425	A-14-05 31DDB	C	
20 B	11/15/1979	9	D	121VERD	--	--	A-14-05 32BAD		
100 B	06/29/1971	15	D	121VERD	--	--	A-14-05 32BBB1	I	C
--	--	--	--	--	--	--	A-14-05 32BBB2		
15 B	05/12/1979	12	D	121VERD	--	2100	A-14-05 32BDC	C	
--	--	--	--	121VERD	--	--	A-14-05 32CBB1	I	
--	--	--	D	121VERD	20.0	--	A-14-05 32CBB2		I
--	--	--	--	121VERD	19.5	840	A-14-05 32CCC	I	
30 B	05/18/1979	5	D	121VERD	--	--	A-14-05 32DCC		
--	--	--	--	--	--	--	A-14-06 16DBA		
--	--	--	--	--	--	--	A-14-06 26BDB		
--	--	--	--	111ALVM	--	--	A-14-10 04ABD		I
150 R	07/13/1966	--	--	310CCNN	--	--	A-14-10 30ACA	B	
525 R	06/09/1966	20	--	310CCNN	--	--	A-14-10 32DBD		A
--	--	--	--	121VERD	--	--	A-15-03 01CBD		
--	--	--	--	--	19.0	510	A-15-03 01CCB1		
--	--	--	--	--	--	--	A-15-03 01CCC		
--	--	--	--	--	--	650	A-15-03 01CCD1		
--	--	--	--	--	--	--	A-15-03 01CCD2		
--	--	--	--	121VERD	--	--	A-15-03 01DCB		
--	--	--	--	121VERD	--	--	A-15-03 01DCC		
--	--	--	--	--	--	--	A-15-03 01DCD2		
--	--	--	--	121VERD	--	--	A-15-03 01DDB1		
--	--	--	--	121VERD	--	--	A-15-03 01DDB2		
--	--	--	--	--	--	--	A-15-03 01DDB3		
--	--	--	--	--	--	--	A-15-03 01DDC1		
--	--	--	--	--	--	--	A-15-03 01DDC2		
--	--	--	--	121VERD	--	--	A-15-03 02AAB		
--	--	--	--	121VERD	--	--	A-15-03 02CBB	B	
--	--	--	--	--	--	--	A-15-03 02DAA		
--	--	--	--	--	--	--	A-15-03 02DAB1		
--	--	--	--	--	--	--	A-15-03 02DAB2		
--	--	--	--	--	--	--	A-15-03 02DAC		
--	--	--	--	--	--	510	A-15-03 02DAD		
--	--	--	--	--	--	--	A-15-03 02DBD		
150 M	04/ /1977	115	D	121VERD	--	--	A-15-03 04DAC	I	
90 V F	02/24/1978	--	--	--	29.0	580	A-15-03 05BAA	I	
0.4 VF	02/24/1978	--	G	330RDLL	21.0	580	A-15-03 05BDB		
--	--	--	--	121VERD	--	--	A-15-03 10ABB		
--	--	--	D	121VERD	--	520	A-15-03 10CBB		
--	--	--	D	121VERD	--	--	A-15-03 10DCD		
--	--	--	--	--	--	--	A-15-03 11AAD		
--	--	--	--	--	--	725	A-15-03 11ADA		
--	--	--	D	121VERD	--	500	A-15-03 11BAB1		
--	--	--	D	121VERD	--	500	A-15-03 11BAB2		
200 R	08/17/1977	100	--	121VERD	--	410	A-15-03 11BCC	I	
--	--	--	D	121VERD	--	825	A-15-03 11DAD	I	
--	--	--	D	121VERD	--	--	A-15-03 12AAA		
--	--	--	--	121VERD	20.0	500	A-15-03 12AAB	I	
--	--	--	--	121VERD	--	--	A-15-03 12AAD		
--	--	--	--	121VERD	--	--	A-15-03 12ABB		
--	--	--	D	121VERD	--	--	A-15-03 12ACC4		

LOCAL NUMBER	DATE COMPLETED	METHOD CONST-RUCTED	FINISH	CASING DIAM-ETER (INCHES)	DEPTH TO FIRST OPENING (FEET)	USE OF WATER	DEPTH OF WELL (FEET)	ALTITUDE OF LAND SURFACE (FEET)	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED
A-15-03 12ACD	11/27/1974	--	X	6.62	52	H	135	3250	16.00	R	11/27/1974
A-15-03 12ADB1	06/ /1949	--	X	8	30	U	400	3265	17.98	S	10/14/1958
A-15-03 12ADB2	--	--	--	7	--	U	42	3260	23.60	S	10/14/1958
A-15-03 12ADB3	09/03/1970	--	X	6.62	53	H	111	3260	31.35	T	08/16/1977
A-15-03 12ADD1	03/07/1969	--	--	6	--	H	115	3240	20.20	T	08/17/1977
A-15-03 12ADD2	1971	--	--	8	--	H,I	123	3240	14.05	T	08/17/1977
A-15-03 12BAA1	1969	--	--	6	--	H	140	3270	33.85	T	08/23/1977
A-15-03 12BAA2	08/05/1974	--	X	6.62	45	H	138	3270	35.00	R	08/05/1974
A-15-03 12BAA3	10/10/1974	--	X	6.62	41	H	145	3270	31.60	T	08/23/1977
A-15-03 12BAC	--	--	--	6.62	--	U	--	3265	31.20	T	08/24/1977
A-15-03 12BBA	1977	--	--	6.62	--	H	--	3260	21.10	T	08/24/1977
A-15-03 12BBC1	1959	--	--	6.62	--	P	210	3255	32.00	R	02/ /1977
A-15-03 12BBD	--	--	--	6.62	--	H	--	3255	15.60	T	08/24/1977
A-15-03 12BCB	08/31/1977	C	X	8	43	H	360	3250	17.00	R	08/31/1977
A-15-03 12BCC	1965	--	--	--	--	H	60	3250	20.00	R	--
A-15-03 12BDC	1965	--	--	6.62	--	H	86	3250	13.90	T	08/23/1977
A-15-03 12DAB	--	--	--	11	--	I	28	3245	12.00	R	03/ /1977
A-15-03 12DBA1	--	--	--	11	--	I	--	3245	9.90	T	08/16/1977
A-15-03 12DBA2	--	--	--	6	--	H	90	3245	10.70	S	08/16/1977
A-15-03 12DBA3	--	--	--	12	--	I	150	3240	9.60	S	08/16/1977
A-15-03 12DBB2	1977	--	--	10	--	H,I	52	3245	8.80	T	08/16/1977
A-15-03 13ABC	--	--	--	8	--	P	--	3320	98.60	TR	12/20/1977
A-15-03 13ADA	--	--	--	10	--	--	--	3290	78.45	TR	12/20/1977
A-15-03 13CDA	--	--	--	8.62	--	P	--	3405	224.30	TR	12/20/1977
A-15-03 15CCD	04/11/1973	C	X	6	--	H	535	3690	489.40	T	03/23/1978
A-15-03 16CDD	--	--	--	6.62	--	S	--	3773	84.30	T	03/23/1978
A-15-03 20BAB	--	--	--	8.62	--	H	--	4180	5.65	TR	04/05/1978
A-15-03 21AAD1	1956	--	X	6.62	--	U	550	3725	319.30	T	03/23/1978
A-15-03 21AAD2	--	--	--	--	--	H,S	650	3720	--		--
A-15-03 21DCC	--	--	--	24	--	U	--	3830	58.30	T	04/05/1978
A-15-03 23BDD	1957	--	X	8	--	P	450	3550	370.00	S	03/23/1978
A-15-03 36DAA	--	--	--	6	--	S	240	3460	230.00	R	--
A-15-04 01BAA	10/ /1950	C	X	8	--	S	274	3560	221.50	S	07/21/1977
A-15-04 02BAA1	1965	--	X	6	400	H,I	500	3450	115.85	S	06/28/1977
A-15-04 02BAA2	03/20/1972	--	X	6	200	H	223	3445	117.10	S	06/29/1977
A-15-04 02BAB1	12/03/1971	--	X	6	--	H	225	3435	110.00	R	12/03/1971
A-15-04 02BAB2	06/ /1977	--	--	6.62	--	U	172	3430	100.25	S	06/29/1977
A-15-04 02BAC	1970	--	--	6	--	--	200	3425	106.45	S	06/28/1977
A-15-04 02BBC	1970	C	X	8	200	H,I	305	3410	84.90	SR	07/21/1977
A-15-04 02BBD	12/10/1976	--	P	6.62	96	H	156	3410	85.20	S	06/28/1977
A-15-04 02BCA1	12/23/1973	--	X	8	204	I	260	3425	95.00	R	12/23/1974
A-15-04 02BCA2	1964	--	X	6	172	H	195	3430	90.00	R	11/ /1976
A-15-04 02BCC	04/27/1973	C	P	6	120	H	140	3410	60.00	R	04/27/1973
A-15-04 02BCD	02/ /1970	--	X	8.62	138	H	192	3430	98.15	S	06/28/1977
A-15-04 02BDC	1962	--	--	6	--	H	165	3435	94.80	S	06/28/1977
A-15-04 02CAB	10/ /1972	--	--	6.62	--	H,S	347	3450	123.30	SR	06/28/1977
A-15-04 02CBB2	05/26/1977	--	X	6.62	124	H	185	3410	66.55	S	06/28/1977
A-15-04 02CCB1	--	--	--	6	--	H	150	3420	83.20	S	06/28/1977
A-15-04 02CCB2	1957	--	--	8	92	H	100	3420	72.23	S	06/11/1959
A-15-04 02CCB3	07/06/1972	C	X	8	187	H	210	3425	112.00	R	07/06/1972
A-15-04 02CCB4	02/15/1974	--	X	8.62	178	I	300	3420	103.65	TR	07/26/1977
A-15-04 02CCC1	--	--	--	6	--	H,I	127	3430	109.90	S	06/16/1977
A-15-04 02CCC2	1957	--	X	6.62	128	H	135	3430	93.50	S	04/30/1959
A-15-04 02CCC3	--	--	--	6	--	U	--	3430	108.00	T	07/26/1977
A-15-04 02CCC4	1957	--	--	6	--	H	130	3450	70.00	R	--
A-15-04 02CCC5	1958	--	--	6	--	--	135	3450	92.00	R	10/ /1958
A-15-04 02CCC6	1959	--	--	6	--	H	135	3450	--		--
A-15-04 02CCC7	--	--	--	6	--	H	170	3450	100.00	R	02/13/1967
A-15-04 02CCD1	1972	--	--	6	--	H,I	170	3440	116.50	S	06/16/1977
A-15-04 02CCD2	--	--	--	6.62	--	--	--	3440	126.40	S	06/28/1977
A-15-04 02CCD3	--	--	--	6.62	--	U	--	3435	113.05	S	06/28/1977
A-15-04 03AAC1	--	--	--	6.50	--	U	--	3390	61.07	S	06/16/1977
A-15-04 03AAC2	--	--	--	8.50	--	I	--	3390	64.20	S	06/16/1977
A-15-04 03ACA	06/ /1977	C	X	6.50	512	U	545	3385		F	08/02/1977
A-15-04 03ACB1	11/22/1973	--	X	6.62	317	H	340	3365	46.70	S	06/16/1977
A-15-04 03ACB2	04/24/1973	C	X	6	312	H	341	3370	45.00	R	04/24/1973
A-15-04 03ACC	10/29/1973	C	X	6.62	299	H	333	3370	40.00	R	10/29/1973
A-15-04 03ADA2	--	--	--	6.62	--	I	--	3420	77.42	S	06/16/1977
A-15-04 03ADB	1974	--	--	6.50	--	H	--	3390	59.40	S	06/16/1977
A-15-04 03ADD1	1977	--	--	6.50	--	U	--	3425	88.20	S	06/16/1977
A-15-04 03ADD2	--	C	--	6.62	--	U	240	3420	78.60	S	06/16/1977
A-15-04 03BBC	03/03/1977	C	X	6	210	H	250	3330	22.50	R	03/03/1977
A-15-04 03BCD	07/ /1977	--	--	6.62	--	U	--	3350	30.35	T	08/02/1977
A-15-04 03BDA	09/12/1969	C	X	8	226	H	235	3360	33.55	SP	06/16/1977
A-15-04 03BDC1	05/05/1972	--	X	6	193	H	208	3350	33.00	R	05/05/1972
A-15-04 03BDC2	11/29/1972	C	X	6	199	H	202	3350	40.00	R	11/29/1972
A-15-04 03BDD1	1970	--	--	6.50	--	I	197	3365	41.40	S	06/16/1977
A-15-04 03BDD2	05/ /1959	--	X	6.50	214	H	220	3365	38.40	S	03/02/1960
A-15-04 03CAA1	1973	--	--	--	--	H	227	3360	29.00	R	06/ /1976
A-15-04 03CAA2	11/02/1973	--	X	6.62	185	H	200	3360	140.00	R	11/02/1973

DISCHARGE (GALLONS PER MINUTE)	DATE DISCHARGE MEASURED	DRAW-DOWN (FEET)	TYPES OF LOGS AVAILABLE	PRINCIPAL AQUIFER	TEMPERATURE (DEGREES °C)	SPECIFIC CONDUCTANCE (UMHOS/CM AT 25° C)	LOCAL NUMBER	OTHER DATA AVAILABLE QW	WL
--	--	--	D	121VERD	--	--	A-15-03 12ACD		
400 R	10/14/1958	--	D	121VERD	--	--	A-15-03 12ADB1		A
--	--	--	--	111ALVM	--	--	A-15-03 12ADB2		A
20 B	09/03/1970	65	D	121VERD	--	--	A-15-03 12ADB3		
--	--	--	--	121VERD	--	--	A-15-03 12ADD1		
--	--	--	--	121VERD	18.0	1050	A-15-03 12ADD2	I	
--	--	--	--	121VERD	--	--	A-15-03 12BAA1		
--	--	--	D	121VERD	--	--	A-15-03 12BAA2		
--	--	--	D	121VERD	--	--	A-15-03 12BAA3		
--	--	--	--	--	--	--	A-15-03 12BAC		
--	--	--	--	121VERD	19.0	600	A-15-03 12BBA	I	
20 R	08/24/1977	--	--	121VERD	--	--	A-15-03 12BBC1		
--	--	--	--	--	--	--	A-15-03 12BBD		
50 B	08/31/1977	45	D	121VERD	--	--	A-15-03 12BCB		
--	--	--	--	--	--	--	A-15-03 12BCC		
--	--	--	--	--	--	850	A-15-03 12BDC		
--	--	--	--	111ALVM	--	--	A-15-03 12DAB		
--	--	--	--	--	--	--	A-15-03 12DBA1		
--	--	--	--	--	--	--	A-15-03 12DBA2		
--	--	--	--	121VERD	--	--	A-15-03 12DBA3		
--	--	--	--	--	--	--	A-15-03 12DBB2		
--	--	--	--	--	--	600	A-15-03 13ABC		
--	--	--	--	--	--	--	A-15-03 13ADA		
37 M	12/20/1977	--	--	121VERD	20.5	490	A-15-03 13CDA	I	
--	--	--	D	121VERD	--	540	A-15-03 15CCD	I	
--	--	--	--	--	--	--	A-15-03 16CDD		
17 R	04/05/1978	--	--	121VERD	--	625	A-15-03 20BAB	I	
--	--	--	--	121VERD	--	--	A-15-03 21AAD1	B	
--	--	--	--	121VERD	--	375	A-15-03 21AAD2		
--	--	--	--	--	--	--	A-15-03 21DCC		
--	--	--	--	121VERD	23.5	440	A-15-03 23BDD	I	
--	--	--	--	--	20.0	540	A-15-03 36DAA		
--	--	--	--	121VERD	--	--	A-15-04 01BAA		
--	--	--	--	121VERD	24.5	1600	A-15-04 02BAA1	C	
--	--	--	D	121VERD	--	--	A-15-04 02BAA2		
--	--	--	D	121VERD	--	--	A-15-04 02BAB1		
--	--	--	--	121VERD	--	--	A-15-04 02BAB2		
--	--	--	--	121VERD	--	1350	A-15-04 02BAC		
15 R	07/21/1977	--	--	121VERD	--	950	A-15-04 02BBC		
--	--	--	D	121VERD	--	--	A-15-04 02BBD		
30 R	12/23/1973	--	D	121VERD	21.5	1200	A-15-04 02BCA1	I	
--	--	--	D	121VERD	20.5	600	A-15-04 02BCA2		
11 B	04/27/1973	--	D	121VERD	--	--	A-15-04 02BCC		
--	--	--	--	121VERD	--	--	A-15-04 02BCD		
--	--	--	--	121VERD	21.0	580	A-15-04 02BDC	B	
--	--	--	--	121VERD	--	1425	A-15-04 02CAB		
20 B	05/26/1977	30	D	121VERD	19.5	560	A-15-04 02CBB2		
--	--	--	--	121VERD	--	--	A-15-04 02CCB1		
--	--	--	--	121VERD	19.0	--	A-15-04 02CCB2	B	S
--	--	--	D	121VERD	--	--	A-15-04 02CCB3		
40 B	02/15/1974	95	D	121VERD	--	910	A-15-04 02CCB4		A
--	--	--	--	121VERD	--	--	A-15-04 02CCC1		
--	--	--	--	121VERD	--	--	A-15-04 02CCC2	B	I
--	--	--	--	121VERD	--	--	A-15-04 02CCC3		
--	--	--	D	--	--	--	A-15-04 02CCC4		
--	--	--	--	--	--	--	A-15-04 02CCC5		
--	--	--	--	--	--	--	A-15-04 02CCC6		
20 R	02/13/1967	22	D	--	--	--	A-15-04 02CCC7		
--	--	--	--	121VERD	--	--	A-15-04 02CCD1		
--	--	--	--	121VERD	--	--	A-15-04 02CCD2		
--	--	--	--	121VERD	--	--	A-15-04 02CCD3		
--	--	--	--	121VERD	--	--	A-15-04 03AAC1		
--	--	--	--	121VERD	--	--	A-15-04 03AAC2		
200 B F	06/ /1977	--	D	121VERD	27.5	1500	A-15-04 03ACA	I	
--	--	--	D	121VERD	--	--	A-15-04 03ACB1		
--	--	--	D	121VERD	--	--	A-15-04 03ACB2		
--	--	--	D	121VERD	--	--	A-15-04 03ACC		
--	--	--	--	121VERD	--	--	A-15-04 03ADA2		
--	--	--	--	121VERD	--	1300	A-15-04 03ADB		
--	--	--	--	121VERD	--	--	A-15-04 03ADD1		
--	--	--	--	121VERD	--	--	A-15-04 03ADD2		
40 B	03/03/1977	0	D	121VERD	--	--	A-15-04 03BBC		
--	--	--	--	121VERD	--	710	A-15-04 03BCD		
40 B	09/12/1969	0	D	121VERD	21.0	780	A-15-04 03BDA	B	
--	--	--	D	121VERD	--	--	A-15-04 03BDC1		
--	--	--	D	121VERD	--	--	A-15-04 03BDC2		
--	--	--	--	121VERD	--	--	A-15-04 03BDD1		
--	--	--	--	121VERD	--	--	A-15-04 03BDD2		
--	--	--	--	121VERD	--	1070	A-15-04 03CAA1	C	
--	--	--	D	121VERD	--	--	A-15-04 03CAA2		

LOCAL NUMBER	DATE COMPLETED	METHOD CONST-RUCTED	FINISH	CASING DIAM-ETER (INCHES)	DEPTH TO FIRST OPENING (FEET)	USE OF WATER	DEPTH OF WELL (FEET)	ALTITUDE OF LAND SURFACE (FEET)	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED
A-15-04 03CAC1	08/27/1973	--	P	6	--	H,I	142	3340	48.40	SR	06/14/1977
A-15-04 03CAC2	--	--	--	6	--	U	--	3370	42.15	S	06/14/1977
A-15-04 03CAC3	03/01/1972	C	--	6.62	221	--	230	3360	60.00	R	03/01/1972
A-15-04 03CAD2	--	--	--	8	--	H	295	3365	37.60	S	06/14/1977
A-15-04 03CBA	1963	--	--	5.50	--	H	--	3345	20.50	S	06/16/1977
A-15-04 03CBD	--	--	--	7	--	H	225	3340	38.60	S	06/14/1977
A-15-04 03CCB	--	--	--	6	--	H	70	3310	16.65	S	06/14/1977
A-15-04 03CCC1	1958	--	--	6	--	H	52	3305	12.05	S	06/14/1977
A-15-04 03CCC2	03/22/1973	C	X	6	55	H	85	3300	10.55	S	06/14/1977
A-15-04 03DAA2	--	--	--	6	--	H	160	3405	31.70	S	06/16/1977
A-15-04 03DAB1	04/03/1973	C	X	6	216	I,H	250	3410	80.00	R	04/03/1973
A-15-04 03DAB2	05/02/1972	C	X	6	223	H	260	3405	76.20	SR	06/16/1977
A-15-04 03DBD	--	--	--	--	--	H	40	3370	--		--
A-15-04 03DDA1	1959	--	--	6	--	H	470	3410	84.75	S	06/29/1977
A-15-04 03DDA2	02/04/1977	C	X	6	111	--	141	3410	52.00	R	02/04/1977
A-15-04 03DDC	--	--	--	6	--	H	--	3415	85.13	S	06/28/1977
A-15-04 03DDD	1957	--	--	6	--	P,H	160	3420	90.45	S	06/29/1977
A-15-04 04AAA1	1963	--	X	6	320	I,H,S	360	3310	12.00	R	01/ /1977
A-15-04 04AAA2	10/10/1959	C	X	8	120	I	153	3320	13.95	S	06/14/1977
A-15-04 04AAA3	11/05/1969	C	X	8	161	I,H	240	3310	2.20	SR	06/14/1977
A-15-04 04AAB	06/ /1961	C	X	8	219	S	245	3305		F	06/14/1977
A-15-04 04AAD1	1958	--	--	6	--	I,H	247	3315		F	06/14/1977
A-15-04 04AAD2	1967	--	--	6	--	H	190	3325	8.50	S	06/14/1977
A-15-04 04ADB	--	--	--	6	--	H	--	3310	26.75	S	06/09/1977
A-15-04 04ADC	--	--	--	6	--	H	90	3310	27.60	S	06/09/1977
A-15-04 04DAB	07/17/1975	--	--	6	--	H	82	3315	27.90	SR	06/09/1977
A-15-04 04DAD	1962	--	--	6.62	--	H	97	3320	41.00	S	06/09/1977
A-15-04 04DDA	1950	--	--	5	--	H	50	3320	20.10	S	06/14/1977
A-15-04 04DDB	1956	--	--	6	--	H	105	3360	42.85	S	06/07/1977
A-15-04 04DDC1	03/ /1959	--	P	8	--	H	250	3355	36.85	S	08/18/1959
A-15-04 04DDC2	1976	--	--	7	--	H	--	3370	36.35	SR	06/14/1977
A-15-04 04DDD1	--	--	--	6	--	H	82	3330	43.20	SR	06/09/1977
A-15-04 04DDD2	--	--	--	6	--	H	80	3310	27.20	SR	06/14/1977
A-15-04 07BCC	--	--	--	6.62	--	I	--	3285	65.70	S	08/16/1977
A-15-04 07CCB	03/14/1972	C	X	6.62	56	H	155	3250	55.00	R	03/14/1972
A-15-04 09ADD	1976	H	F	8	238	H,I	358	3315		F	1976
A-15-04 09DAA1	1968	--	X	6	90	H	110	3335	37.65	S	07/12/1977
A-15-04 09DAA2	1968	--	--	6.62	--	H	--	3330	36.25	S	07/12/1977
A-15-04 09DAD1	07/ /1977	--	--	6.62	--	U	--	3355	65.30	S	07/12/1977
A-15-04 09DAD2	12/07/1973	C	P	--	138	H	200	3360	85.00	R	12/07/1973
A-15-04 09DAD3	1977	--	--	--	--	H,I	--	3360	--		--
A-15-04 09DAD4	--	--	--	--	--	--	--	3340	--		--
A-15-04 09DDA	--	--	--	6.62	--	H	162	3360	65.50	T	07/21/1977
A-15-04 10ACC	1971	--	--	6.62	--	H	173	3380	106.80	SR	07/12/1977
A-15-04 10BCB1	09/17/1971	--	X	6.62	67	H	120	3296	15.00		09/17/1971
A-15-04 10CAA1	--	--	--	6	--	H	264	3385	94.00	SR	06/29/1977
A-15-04 10CAA2	01/07/1972	C	F	6	39	U	73	3300	18.70	T	07/26/1977
A-15-04 10CCA1	--	--	--	6.62	--	H	--	3320	41.24	S	07/12/1977
A-15-04 10CCA2	--	--	--	6.62	--	H	110	3300	21.50	S	07/12/1977
A-15-04 10CDA	--	--	--	8	--	H	300	3320	46.20	S	07/12/1977
A-15-04 10DCA1	1973	--	--	6.62	--	H	178	3320	54.35	T	07/26/1977
A-15-04 10DCA2	08/12/1976	C	X	6.62	178	I	180	3310	53.70	SR	07/27/1977
A-15-04 10DCC1	1971	--	--	--	--	H,I	175	3270	40.00	R	1971
A-15-04 10DCC2	09/ /1974	--	--	6.62	--	U	250	3335	71.90	S	07/27/1977
A-15-04 10DDB1	1947	--	--	6	--	H,S	155	3305	30.00	R	1976
A-15-04 10DDB2	1960	--	X	6	--	H	142	3310	57.50	T	07/27/1977
A-15-04 11BBC1	1963	--	--	6.62	--	H	176	3415	116.60	S	06/29/1977
A-15-04 11BBC2	01/28/1972	--	--	6.62	120	H	160	3410	111.00	S	06/29/1977
A-15-04 11BBC3	08/29/1974	--	X	6.62	154	H	160	3400	109.00	R	08/29/1974
A-15-04 11BBD1	--	--	--	6	--	H	240	3435	146.25	S	06/29/1977
A-15-04 11BBD2	--	--	--	6	--	H	152	3420	--		--
A-15-04 11BBD3	05/08/1973	C	X	6	186	H	240	3430	137.00	R	05/08/1973
A-15-04 11BBD4	03/04/1975	--	P	6	50	H	200	3430	70.00	R	03/04/1975
A-15-04 12ABB	08/ /1974	C	P	8	661	U	946	3580	206.79	T	11/13/1974
A-15-04 15AAC	1948	--	--	6.62	--	H	132	3290	28.00	S	06/29/1977
A-15-04 15ACA	07/03/1968	--	X	10.75	200	U	300	3270		F	06/29/1977
A-15-04 15BAA	--	--	--	6.62	--	--	200	3280	51.10	TR	07/12/1977
A-15-04 15CAA	--	--	--	8	--	U	--	3365	105.00	T	07/26/1977
A-15-04 15DAC	07/01/1972	C	X	10	300	P	450	3260		F	07/01/1972
A-15-04 15DBA	05/16/1977	--	X	12.88	80	H,I	250	3240		F	08/16/1977
A-15-04 17ABA	--	--	--	13	--	U	--	3440	194.00	T	08/02/1977
A-15-04 17ADA	--	--	--	--	--	--	--	3450	--		--
A-15-04 17BBA	--	--	--	--	--	U	--	3460	212.80	T	07/27/1977
A-15-04 17BDB	06/30/1977	C	X	6.62	69	U	300	3445	235.70	S	08/16/1977
A-15-04 17CCB	1950	--	--	--	--	H	50	3240	--		--
A-15-04 18ABB	03/03/1977	--	X	6.62	30	H	200	3270	56.00	T	08/17/1977
A-15-04 18ABC1	--	--	--	8.62	--	H	--	3250	27.00	T	08/17/1977
A-15-04 18ABC2	--	--	--	6.62	--	H	--	3250	32.80	T	08/17/1977
A-15-04 18BDD	02/ /1970	--	--	8.62	--	P	--	3270	77.85	TR	12/20/1977
A-15-04 18DCA	--	--	--	6.62	--	T	50	3225	14.60	T	08/16/1977

DISCHARGE (GALLONS PER MINUTE)		DATE DISCHARGE MEASURED	DRAW-DOWN (FEET)	TYPES OF LOGS AVAILABLE	PRINCIPAL AQUIFER	TEMPERATURE (DEGREES °C)	SPECIFIC CONDUCTANCE (UMHOS/CM AT 25° C)	LOCAL NUMBER	OTHER DATA AVAILABLE QW	WL
--		--	--	--	121VERD	--	--	A-15-04 03CAC1		
--		--	--	--	121VERD	--	--	A-15-04 03CAC2		
--		--	--	D	121VERD	--	--	A-15-04 03CAC3		
--		--	--	--	121VERD	--	--	A-15-04 03CAD2		
--		--	--	--	121VERD	--	--	A-15-04 03CBA		
--		--	--	--	121VERD	--	--	A-15-04 03CBD		
--		--	--	--	--	--	--	A-15-04 03CCB		
--		--	--	--	--	--	900	A-15-04 03CCC1		
--		--	--	D	121VERD	--	560	A-15-04 03CCC2		
--		--	--	--	121VERD	--	700	A-15-04 03DAA2	C	
37 B		04/03/1973	70	D	121VERD	--	1350	A-15-04 03DAB1	I	
27 B		05/02/1972	20	D	121VERD	--	--	A-15-04 03DAB2		
--		--	--	--	--	15.5	600	A-15-04 03DBD		
--		--	--	--	121VERD	--	1500	A-15-04 03DDA1		
20 B		02/04/1977	20	D	121VERD	--	--	A-15-04 03DDA2		
--		--	--	--	--	--	--	A-15-04 03DDC		
--		--	--	--	121VERD	--	560	A-15-04 03DDD	C	
400 R		1963	2	--	121VERD	21.0	850	A-15-04 04AAA1	I	
35 B		10/10/1959	20	D	121VERD	--	--	A-15-04 04AAA2		
--		--	--	D	121VERD	22.0	750	A-15-04 04AAA3		
2 E	F	06/14/1977	--	D	121VERD	--	--	A-15-04 04AAB		
300 E	F	06/14/1977	--	D	121VERD	20.0	650	A-15-04 04AAD1	I	
--		--	--	--	121VERD	--	--	A-15-04 04AAD2		
--		--	--	--	--	--	--	A-15-04 04ADB		
--		--	--	--	--	--	--	A-15-04 04ADC		
24 R		07/17/1975	60	D	121VERD	--	--	A-15-04 04DAB		
--		--	--	--	121VERD	19.0	585	A-15-04 04DAD	B	
--		--	--	--	--	--	--	A-15-04 04DDA		
--		--	--	--	121VERD	--	--	A-15-04 04DDB		
--		--	--	--	121VERD	--	--	A-15-04 04DDC1		A
--		--	--	--	121VERD	--	540	A-15-04 04DDC2		
--		--	--	--	121VERD	--	--	A-15-04 04DDD1		
--		--	--	--	--	--	1200	A-15-04 04DDD2		
--		--	--	--	121VERD	--	--	A-15-04 07BCC		
--		--	--	D	121VERD	--	--	A-15-04 07CCB		
--		--	--	D	121VERD	22.0	900	A-15-04 09ADD	I	I
--		--	--	--	121VERD	--	--	A-15-04 09DAA1		
--		--	--	--	121VERD	--	510	A-15-04 09DAA2		
--		--	--	--	121VERD	--	--	A-15-04 09DAD1		
--		--	--	D	121VERD	--	--	A-15-04 09DAD2		
--		--	--	--	--	--	--	A-15-04 09DAD3		
--		--	--	--	--	--	--	A-15-04 09DAD4		
--		--	--	--	121VERD	--	540	A-15-04 09DDA		
--		--	--	--	121VERD	21.0	890	A-15-04 10ACC		
--		--	--	D	121VERD	--	--	A-15-04 10BCB1		
--		--	--	--	121VERD	21.5	690	A-15-04 10CAA1		
--		--	--	D	121VERD	--	--	A-15-04 10CAA2		
--		--	--	--	--	19.5	900	A-15-04 10CCA1		
--		--	--	--	--	--	--	A-15-04 10CCA2		
--		--	--	--	121VERD	--	650	A-15-04 10CDA		
--		--	--	--	121VERD	--	660	A-15-04 10DCA1	C	
33 B		08/12/1976	--	D	121VERD	--	700	A-15-04 10DCA2		
--		--	--	--	--	--	--	A-15-04 10DCC1		
--		--	--	--	121VERD	--	--	A-15-04 10DCC2		
--		--	--	--	121VERD	--	--	A-15-04 10DDB1		
--		--	--	--	121VERD	--	--	A-15-04 10DDB2		
--		--	--	--	121VERD	--	950	A-15-04 11BBC1		
--		--	--	D	121VERD	--	--	A-15-04 11BBC2		
--		--	--	D	121VERD	--	--	A-15-04 11BBC3		
--		--	--	--	121VERD	21.0	1100	A-15-04 11BBD1	I	
--		--	--	--	121VERD	--	--	A-15-04 11BBD2		
--		--	--	D	121VERD	--	--	A-15-04 11BBD3		
--		--	--	D	121VERD	--	--	A-15-04 11BBD4		
70 R		11/15/1974	66	D	310SUPI	--	--	A-15-04 12ABB	B	I
--		--	--	--	121VERD	20.0	1080	A-15-04 15AAC		
13 V	F	06/29/1977	--	D	121VERD	21.0	1200	A-15-04 15ACA	B	
--		--	--	--	121VERD	--	800	A-15-04 15BAA		
--		--	--	--	121VERD	--	--	A-15-04 15CAA		
--		--	--	D	121VERD	21.5	1375	A-15-04 15DAC	I	I
175 R	F	05/16/1977	--	D	121VERD	21.0	1300	A-15-04 15DBA		
--		--	--	--	121VERD	--	--	A-15-04 17ABA		
--		--	--	--	--	--	--	A-15-04 17ADA		
--		--	--	--	121VERD	--	--	A-15-04 17BBA		
22 B		06/30/1977	0	D	121VERD	--	--	A-15-04 17BDB		
--		--	--	--	--	--	--	A-15-04 17CCB		
--		--	--	D	121VERD	19.5	470	A-15-04 18ABB	I	
--		--	--	--	121VERD	--	--	A-15-04 18ABC1		
--		--	--	--	121VERD	--	--	A-15-04 18ABC2		
238 R		02/27/1970	135	--	121VERD	20.5	500	A-15-04 18BDD		
--		--	--	--	--	--	--	A-15-04 18DCA		

LOCAL NUMBER	DATE COMPLETED	METHOD CONST-RUCTED	FINISH	CASING DIAM-ETER (INCHES)	DEPTH TO FIRST OPENING (FEET)	USE OF WATER	DEPTH OF WELL (FEET)	ALTITUDE OF LAND SURFACE (FEET)	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED
A-15-04 18DDB1	11/01/1970	--	X	8	28	H,I	152	3250	50.00	T	08/16/1977
A-15-04 18DDB2	09/12/1976	--	X	6	35	H,I	201	3255	61.25	T	08/16/1977
A-15-04 18DDD1	04/13/1972	C	X	6.62	63	H	200	3290	101.00	SR	08/02/1977
A-15-04 18DDD2	11/17/1972	--	--	6.62	60	H	200	3290	105.00	R	11/17/1972
A-15-04 19AAA	05/27/1977	C	X	6.62	55	H	170	3270	76.15	T	08/02/1977
A-15-04 19AAD	08/25/1973	C	X	6.62	46	H	100	3230	44.70	T	08/02/1977
A-15-04 20BDB	--	--	--	10	--	U	--	3280	98.25	T	08/02/1977
A-15-04 20CAC	1967	--	--	8.62	--	H	160	3230	54.65	T	08/02/1977
A-15-04 21CBA1	1950	--	--	--	--	I	30	3200	--		--
A-15-04 21CBA2	07/03/1957	--	X	6.62	43	H	85	3225	58.00	T	08/02/1977
A-15-04 22ABA	07/01/1976	C	X	8	65	--	322	3270		F	07/01/1976
A-15-04 22BAB	07/29/1976	C	X	8	80	--	367	3240		F	07/29/1976
A-15-04 22BBA	1950	--	X	6	120	S	280	3225		F	07/27/1977
A-15-04 22BCC	1950	--	--	6.62	--	H	90	3210	24.30	T	07/27/1977
A-15-04 33DCB	1954	--	X	8	285	T	510	3215	70.00	R	1954
A-15-04 33DCC	--	--	--	6	--	H	110	3185	57.00	S	06/09/1977
A-15-05 06BCD	02/22/1974	C	X	6.62	321	U	553	3700	379.40	T	07/21/1977
A-15-05 20ABB	1956	C	X	8	--	S,H	500	3560	396.65	SR	03/23/1978
A-15-05 24DCA	07/ /1959	--	P	6	150	P	398	3780	201.15	S	03/23/1978
A-15-05 27CCC	04/07/1972	C	X	6	85	U	370	3400	95.80	S	04/19/1978
A-15-05 28DDA	11/25/1971	C	P	10.75	300	H,I	375	3420	150.00	R	11/25/1971
A-15-05 34CBA	01/01/1958	C	--	6	--	H	175	3310	150.00	R	1956
A-15-05 35AAC	1963	C	--	10	--	H	210	3565	82.00	R	1963
A-15-05 35ACD	11/15/1972	C	X	6	76	H	295	3570	94.10	S	04/19/1978
A-15-05 35ADB	01/01/1968	C	X	8	--	H	265	3565	63.70	S	04/19/1978
A-15-05 35BDD	12/03/1971	C	X	6	97	U	305	3540	65.00	R	12/03/1971
A-15-05 36ABB	--	--	--	11	--	H	--	3580	99.50	T	01/24/1978
A-15-05 36ACC	--	--	--	11	--	U	--	3540	71.80	T	01/24/1978
A-15-05 36CAA	--	--	--	8.62	--	H,S,I	--	3510	31.20	T	01/24/1978
A-15-05 36CCB1	1956	C	X	6	130	H	170	3525	64.10	S	02/02/1978
A-15-05 36CCB2	--	--	--	8	--	P	270	3485	18.00	R	10/11/1975
A-15-05 36CCB3	--	--	--	8	--	P	160	3485	20.00	R	10/11/1975
A-15-05 36CCC	09/02/1977	C	X	6	66	U	295	3460		F	02/02/1978
A-15-05 36DBB	--	--	--	11	--	H	125	3520	36.20	T	01/24/1978
A-15-06 21DDC	08/ /1958	--	P	10.75	100	P	129	3810	26.00	R	07/16/1974
A-15-06 29CAA	02/25/1965	C	--	6.62	--	H,I,S	242	3650		F	02/09/1978
A-15-06 31CBA1	06/12/1947	--	X	6	64	U	105	3515	49.80	S	02/02/1978
A-15-06 31CBA2	1964	--	--	6.75	--	H,P	--	3515	44.10	SR	02/09/1978
A-16-01 04C UNSURV	1952	--	--	4	--	S	200	5160	178.20	S	06/07/1977
A-16-02 12CAD1	04/30/1956	--	X	6.62	653	N,H	822	3920	344.80	T	02/08/1978
A-16-02 12CAD2	1957	--	P	10	640	N,H	833	3921	390.00	R	1959
A-16-02 24AAB	03/ /1975	C	X	8	400	H	814	4100	709.00	T	02/08/1978
A-16-02 24ABD	--	--	--	6	--	--	--	4140	335.70	T	02/08/1978
A-16-03 08CDB	--	--	--	6	--	U	--	3415	2.20	T	02/09/1978
A-16-03 08DDA	1915	--	C	60	--	U	--	3405	9.80	S	02/09/1978
A-16-03 15CCB	--	D	--	30	--	U	50	3345	11.70	T	02/23/1978
A-16-03 17DBC	1935	--	X	6	247	U	260	3370	0.90	S	02/08/1978
A-16-03 20ABA	07/27/1977	--	X	6	86	U	150	3380	26.10	S	02/08/1978
A-16-03 20DDC	01/26/1977	C	X	6.62	290	U	345	3640	269.30	T	02/08/1978
A-16-03 21BBB	09/29/1975	--	X	6.62	126	P,H	140	3400	40.70	T	02/09/1978
A-16-03 21CDD	08/11/1977	C	X	6.62	240	U	305	3550	206.00	T	02/23/1978
A-16-03 21DCC	--	--	--	6.62	--	U	--	3500	160.10	T	02/23/1978
A-16-03 22BCC	04/ /1952	--	X	6	153	P	313	3400	123.80	T	02/09/1978
A-16-03 22DCD	1916	--	X	10	1200	H	1400	3430	15.50	S	10/15/1958
A-16-03 27BAD	--	--	--	6.62	--	U	--	3770	0.10+	S	02/09/1978
A-16-03 27CCD	06/04/1977	C	X	6.62	66	H	147	3330	45.50	T	02/24/1978
A-16-03 27DAB	--	--	--	6	--	P	360	3315	18.00	S	02/09/1978
A-16-03 28ABD	03/11/1974	C	X	6.62	190	P	275	3420	105.50	S	02/23/1978
A-16-03 28DDB	1915	--	X	6	50	P	300	3360	--		--
A-16-03 28DDD	1920	--	X	7	75	P	360	3355	28.00	S	04/ /1977
A-16-03 29AAD1	01/01/1978	C	X	6	280	H	345	3590	235.30	T	02/08/1978
A-16-03 29AAD2	11/ /1977	C	X	6	267	H	330	3565	270.00	R	11/ /1977
A-16-03 29DBC	05/06/1974	C	X	6.62	105	U	455	3540	144.40	T	02/23/1978
A-16-03 30ABD	1957	--	--	8	--	O	925	3765	360.00	R	05/ /1957
A-16-03 31DCA	1961	--	X	10	149	P	225	3900	27.00	S	10/27/1977
A-16-03 31DCD	07/01/1977	C	X	6.62	51	U	160	3910	40.50	T	02/24/1978
A-16-03 31DDC1	10/ /1976	C	X	6	110	H	226	3870	9.85	SR	12/20/1977
A-16-03 31DDC2	03/13/1978	C	X	6.62	79	--	200	3890	35.10	S	04/04/1978
A-16-03 33AAC	--	C	X	8	202	H	550	3410	155.00	T	02/24/1978
A-16-03 33BBC	03/07/1972	C	F	6.62	70	--	226	3500	75.00	R	03/07/1972
A-16-03 33DCD	11/01/1971	C	F	8.62	80	P	602	3500	120.00	R	11/01/1971
A-16-03 33DDD	1959	--	P	14	350	T,I	940	3460	168.00	R	12/ /1959
A-16-03 34AAA	1968	--	--	8	--	H	100	3300	82.00	R	01/ /1969
A-16-03 34AAD	1920	--	X	6	50	P	300	3310	31.00	R	04/ /1977
A-16-03 34ACD1	1969	C	X	6	42	H	150	3340	85.00	R	08/30/1969
A-16-03 34ACD2	1970	C	X	6.62	34	H	152	3341	100.00		02/03/1970
A-16-03 34ADC	1915	--	X	7	75	P	300	3340	63.00	S	04/ /1977
A-16-03 34CCD1	1920	--	--	16	130	P	1250	3430	138.60	S	03/23/1959
A-16-03 34CCD2	04/21/1972	--	X	10	160	P	630	3430	165.00	R	04/21/1972
A-16-03 34CDC	1920	--	P	8	--	P	1250	3430	215.60	S	01/03/1964

DISCHARGE (GALLONS PER MINUTE)	DATE DISCHARGE MEASURED	DRAW-DOWN (FEET)	TYPES OF LOGS AVAILABLE	PRINCIPAL AQUIFER	TEMPERATURE (DEGREES °C)	SPECIFIC CONDUCTANCE (UMHOS/CM AT 25° C)	LOCAL NUMBER	OTHER DATA AVAILABLE QW	WL
35 B	11/01/1970	55	D	121VERD	18.5	690	A-15-04 18DDB1		
20 B	09/12/1976	130	D	121VERD	--	--	A-15-04 18DDB2		
34 B	04/13/1972	--	D	121VERD	--	470	A-15-04 18DDD1		
--	--	--	D	121VERD	--	--	A-15-04 18DDD2		
--	--	--	--	121VERD	20.5	540	A-15-04 19AAA	I	
30 B	08/25/1973	10	D	121VERD	--	--	A-15-04 19AAD		
--	--	--	--	121VERD	--	--	A-15-04 20BDB		
--	--	--	--	121VERD	--	--	A-15-04 20CAC		
--	--	--	--	121VERD	--	--	A-15-04 21CBA1		
17 B	07/03/1957	--	--	121VERD	--	--	A-15-04 21CBA2		
12 R F	07/01/1976	--	D	121VERD	--	--	A-15-04 22ABA		
9 R F	07/29/1976	--	D	121VERD	--	--	A-15-04 22BAB		
3 E F	07/27/1977	--	--	121VERD	20.5	1300	A-15-04 22BBA		
--	--	--	--	121VERD	19.0	510	A-15-04 22BCC	I	
--	--	--	--	121VERD	22.0	650	A-15-04 33DCB	I	
--	--	--	--	121VERD	--	850	A-15-04 33DCC		
18 B	12/22/1974	0	--	121VERD	--	--	A-15-05 06BCD		
--	--	--	--	121VERD	19.0	600	A-15-05 20ABB	I	
50 R	07/ /1959	--	D	121VERD	19.0	675	A-15-05 24DCA	I	
20 B	09/07/1972	3	D	121VERD	--	--	A-15-05 27CCC		
--	--	--	D	121VERD	--	--	A-15-05 28DDA		
--	--	--	--	--	--	--	A-15-05 34CBA		
--	--	--	D	121VERD	--	--	A-15-05 35AAC	B	
--	--	--	D	121VERD	22.0	750	A-15-05 35ACD	I	
--	--	--	--	121VERD	22.5	650	A-15-05 35ADB		
--	--	--	D	121VERD	--	--	A-15-05 35BDD		
--	--	--	--	121VERD	--	--	A-15-05 36ABB	C	
--	--	--	--	121VERD	--	--	A-15-05 36ACC		
--	--	--	--	121VERD	--	710	A-15-05 36CAA		
--	--	--	--	121VERD	20.0	790	A-15-05 36CCB1	I	
--	--	--	--	121VERD	--	--	A-15-05 36CCB2	I	
--	--	--	--	121VERD	--	--	A-15-05 36CCB3	I	
--	--	--	D	121VERD	16.0	675	A-15-05 36CCC	I	
--	--	--	--	121VERD	20.5	950	A-15-05 36DBB	I	
80 R	05/27/1975	49	D	310SUPI	--	470	A-15-06 21DDC		T
2 R F	02/09/1978	--	D	310SUPI	21.0	600	A-15-06 29CAA	I	
--	--	--	D	121VERD	--	--	A-15-06 31CBA1	B	
--	--	--	--	121VERD	18.5	900	A-15-06 31CBA2	I	
--	--	--	--	341MRTN	--	--	A-16-01 04C UNSURV		
430 P	--	67	G	330RDLL	--	--	A-16-02 12CAD1		
600 R	--	--	--	330RDLL	27.0	650	A-16-02 12CAD2	I	
--	--	--	--	120VLCC	20.5	380	A-16-02 24AAB	I	
--	--	--	--	--	--	--	A-16-02 24ABD		
--	--	--	--	121VERD	--	--	A-16-03 08CDB	B	
--	--	--	--	--	--	--	A-16-03 08DDA		
--	--	--	--	--	--	--	A-16-03 15CCB		
--	--	--	--	121VERD	18.5	520	A-16-03 17DBC	I	
--	--	--	D	121VERD	--	--	A-16-03 20ABA		
14 B	01/26/1977	20	D	121VERD	--	--	A-16-03 20DDC		
--	--	--	D	121VERD	19.0	500	A-16-03 21BBB	I	
14 B	08/11/1977	22	D	121VERD	--	--	A-16-03 21CDD		
--	--	--	--	--	--	--	A-16-03 21DCC		
--	--	--	D	121VERD	--	--	A-16-03 22BCC	I	
1000 R	--	17	--	121VERD	--	--	A-16-03 22DCD		B
--	--	--	--	121VERD	21.0	--	A-16-03 27BAD	B	T
--	--	--	D	121VERD	20.0	460	A-16-03 27CCD		
--	--	--	--	121VERD	--	520	A-16-03 27DAB	I	
--	--	--	D	121VERD	--	--	A-16-03 28ABD		
--	--	--	--	121VERD	--	--	A-16-03 28DDB	I	
210 M	04/ /1977	20	--	121VERD	--	--	A-16-03 28DDD	I	
--	--	--	D	121VERD	--	460	A-16-03 29AAD1	I	
--	--	--	D	121VERD	--	--	A-16-03 29AAD2		
--	--	--	D	121VERD	--	--	A-16-03 29DBC		
220 R	1963	--	--	--	--	--	A-16-03 30ABD	B	T
500 R	10/27/1977	17	D	330RDLL	--	--	A-16-03 31DCA	I	T
--	--	--	D	120VLCC	--	--	A-16-03 31DCD		
--	--	--	--	--	22.0	625	A-16-03 31DDC1	I	
40 B	03/13/1978	15	D	120VLCC	--	--	A-16-03 31DDC2		
--	--	--	--	121VERD	--	--	A-16-03 33AAC		
--	--	--	D	--	--	--	A-16-03 33BBC		
--	--	--	D	121VERD	20.0	500	A-16-03 33DCD	I	
850 R	--	252	D,G	121VERD	--	560	A-16-03 33DDD	I	
--	--	--	D	121VERD	--	--	A-16-03 34AAA		
45 M	04/ /1977	4	--	121VERD	--	--	A-16-03 34AAD	I	
--	--	--	D	--	--	--	A-16-03 34ACD1		
20 B	02/03/1970	--	D	--	--	--	A-16-03 34ACD2		
130 M	04/ /1977	14	--	121VERD	--	--	A-16-03 34ADC	I	
--	--	--	--	121VERD	--	--	A-16-03 34CCD1	I	A
180 R	04/21/1972	180	D	121VERD	--	--	A-16-03 34CCD2	I	T
240 M	04/ /1977	11	--	121VERD	25.0	650	A-16-03 34CDC	B	T

LOCAL NUMBER	DATE COMPLETED	METHOD CONST-RUCTED	FINISH	CASING DIAM-ETER (INCHES)	DEPTH TO FIRST OPENING (FEET)	USE OF WATER	DEPTH OF WELL (FEET)	ALTITUDE OF LAND SURFACE (FEET)	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED
A-16-03 34DDB	04/ /1977	C	X	6	60	H	170	5365	87.10	TR	04/05/1978
A-16-03 35ACA	1936	--	--	6.62	--	H	65	5275	14.40	T	09/01/1977
A-16-03 35ACD1	1950	--	--	--	--	H	97	5280	30.00	R	1976
A-16-03 35ACD2	1967	--	--	--	--	H	160	5290	34.00	R	08/ /1977
A-16-03 35ADC	1976	C	--	6.62	--	H	--	5310	39.70	T	09/07/1977
A-16-03 35ADD1	1966	--	--	--	--	H	250	5340	--		--
A-16-03 35ADD2	--	--	--	6.62	--	H	--	5320	64.60	T	09/07/1977
A-16-03 35CCA	06/06/1968	--	--	6	30	--	100	5300	35.00		08/06/1968
A-16-03 35CCC	08/15/1968	--	--	6	58	H	152	5350	60.00		06/15/1966
A-16-03 35DAB1	1940	--	--	--	--	H	87	5280	34.00	R	1975
A-16-03 35DAB2	1959	--	X	6.62	60	U	120	5260		F	1975
A-16-03 35DAB3	05/ /1977	--	--	--	--	T	200	5280	10.25	S	09/01/1977
A-16-03 35DBD1	--	--	--	--	--	H	250	5275	--		--
A-16-03 35DBD2	--	--	--	--	--	I,H	200	5280	--		--
A-16-03 35DBD3	1972	C	--	6.62	--	U	200	5260	23.70	T	09/07/1977
A-16-03 35DCD	1950	--	--	6	--	H,I	224	5275		F	1950
A-16-03 35DDC	--	--	--	6.62	--	H	390	5290	26.40	T	09/07/1977
A-16-03 36CDC	10/07/1979	--	X	6	0	U	1200	5435	420.00	R	10/07/1979
A-16-03 36DAC	1974	C	X	6	23	S	265	5420	57.00	S	03/07/1975
A-16-04 11CBA	02/ /1959	C	P	6	15	H	50	5655	10.20	S	05/16/1972
A-16-04 12ABC	--	--	--	6	--	H	--	5760	--		--
A-16-04 12BAA1	--	--	--	6	--	H	--	5720	144.60	S	05/16/1972
A-16-04 12BAA2	--	--	--	6	--	H	--	5730	--		--
A-16-04 12BAD	--	--	--	6	--	H	--	5770	--		--
A-16-04 14CBD	04/09/1954	C	P	10	200	I	212	5540		F	08/ /1974
A-16-04 15DDC	03/15/1973	C	X	6.62	51	H	72	5590	30.00	R	03/15/1973
A-16-04 15DDD	1943	C	--	8	--	H,S	180	5590	18.00	R	10/ /1958
A-16-04 20BBB	1959	C	X	12	925	U	1485	5730	173.00	L	02/27/1975
A-16-04 21AAC	1962	C	X	10	72	H,I	392	5590	10.00	R	1962
A-16-04 23ACB	--	--	--	8	--	H	85	5535	37.00	R	1973
A-16-04 23BBC	06/22/1973	--	X	6.62	20	H	247	5590	45.00	R	06/22/1973
A-16-04 23BCA	1956	--	X	8	36	H	160	5540		F	11/ /1956
A-16-04 23CAB	07/ /1971	C	P	6	--	H	276	5560	53.00	S	05/16/1974
A-16-04 23CAC	1953	C	--	6	--	H,I	275	5520		F	10/14/1958
A-16-04 23DBB	05/05/1970	C	F	6	210	H	220	5510		F	05/05/1970
A-16-04 25CCB	03/12/1975	C	X	6	120	H	275	5440	28.00	R	03/ /1975
A-16-04 26DAC	1952	C	--	10	--	I,S	50	5430	11.40	S	05/16/1974
A-16-04 26DCC	01/ /1959	C	X	8	60	H,S	200	5420		F	05/21/1974
A-16-04 26DDC	09/27/1973	C	X	6	182	H	300	5450	40.00	R	09/27/1973
A-16-04 27DCC	10/01/1973	C	P	6.62	60	P	390	5380	21.40	S	05/21/1974
A-16-04 33AAB	04/ /1975	--	--	--	--	--	--	5585	--		--
A-16-04 33AAC	08/02/1974	C	X	6	189	U	260	5570	125.30	S	04/17/1975
A-16-04 34ABB	04/26/1977	R	P	5.56	430	P	600	5360	47.12+	G	05/23/1979
A-16-04 34BCA	1965	C	P	6	60	H	80	5360	40.00	R	05/17/1974
A-16-04 34BCB	08/02/1973	C	P	8.62	90	H	602	5370	66.00	S	05/16/1974
A-16-04 34BCD	1970	C	P	6	60	H	110	5340	40.00	S	05/17/1974
A-16-04 34BDA	1964	C	P	6	--	H,I	130	5370	50.00	R	05/17/1974
A-16-04 34BDB	03/15/1975	C	X	6.62	153	H	300	5360	25.00	R	03/15/1975
A-16-04 34BDC	1971	C	X	6	35	H,I	80	5340	40.50	S	05/17/1974
A-16-04 34BDD	1970	C	P	6	60	H	125	5375	56.40	S	05/17/1974
A-16-04 35AAD	04/21/1972	C	X	6.62	75	H	86	5470	12.00	R	04/21/1972
A-16-04 35BAD	1972	C	X	6	250	H	380	5500	160.00	R	05/21/1974
A-16-04 35BCC	1957	C	X	6	405	T	837	5500	116.40	S	05/16/1974
A-16-04 35CAB	1969	C	X	6	100	H	180	5480	74.00	S	06/17/1974
A-16-04 35CBC	1972	C	X	6	220	H	250	5460	120.00	R	05/21/1974
A-16-04 35CCA1	06/21/1972	C	X	6	136	H	180	5430	40.50	S	05/17/1974
A-16-04 35CCA2	09/15/1972	C	X	6.62	212	--	214	5420	100.00	R	09/15/1972
A-16-04 35CCA3	1972	C	X	6	180	H	206	5445	110.00	R	05/21/1974
A-16-04 35CCD	1971	C	X	6	168	H	200	5430	112.20	S	05/21/1974
A-16-04 35CDC	02/13/1973	C	X	6.62	325	H	402	5435	120.10	S	05/21/1974
A-16-04 35CDD	05/21/1974	C	X	6	280	H	320	5430	120.00	R	05/ /1974
A-16-04 35DCB	02/12/1972	C	X	6.62	383	H	305	5460	43.15	S	06/24/1974
A-16-05 11ACC	--	C	X	8	20	H	868	4190	488.00	R	04/10/1972
A-16-05 11BCA	07/ /1971	P	X	8	20	P	550	4110	414.00	S	07/ /1971
A-16-05 11CBA	05/ /1972	P	X	6	326	H	522	4110	405.00	R	05/ /1972
A-16-05 13ADA	--	--	--	12	--	U	472	4140	170.40	S	04/18/1974
A-16-05 13BBD	04/ /1972	H	X	10	12	P	600	4205	480.00	R	04/ /1972
A-16-05 13BDC	1973	P	X	8	39	P	648	4140	408.00	S	02/22/1973
A-16-05 13CBA	1973	P	X	6	20	T	595	4100	379.00	S	03/06/1973
A-16-05 13DBD	07/ /1968	R	X	6	20	T	502	4095	357.00	R	07/08/1969
A-16-05 13DDA	--	--	--	8	--	P	456	4040	300.00	R	08/23/1972
A-16-05 14ACA	--	C	--	--	--	H	485	4150	440.00	R	1975
A-16-05 14DAD	05/ /1972	P	X	6	160	H	500	4085	382.20	S	08/06/1974
A-16-05 14DBA	05/ /1952	C	--	8	--	H	511	4125	415.00	R	04/07/1973
A-16-05 14DDA	1948	C	X	6	150	H	480	4080	367.00	S	05/ /1970
A-16-05 14DDD	12/ /1973	P	P	8	498	P	582	4095	382.50	S	06/08/1974
A-16-05 24ABD	1955	C	--	6	--	H	345	4080	300.00	R	1955
A-16-05 24ACD	1963	C	X	8	400	P	460	4000	278.65	S	07/12/1972
A-16-05 36CAD	02/ /1960	C	X	8	11	S	150	3750	50.00	R	02/02/1960
A-16-06 08CCC	1950	C	X	6	24	H	620	4260	400.00	R	1950

DISCHARGE (GALLONS PER MINUTE)	DATE DISCHARGE MEASURED	DRAW-DOWN (FEET)	TYPES OF LOGS AVAILABLE	PRINCIPAL AQUIFER	TEMPERATURE (DEGREES °C)	SPECIFIC CONDUCTANCE (UMHOS/CM AT 25° C)	LOCAL NUMBER	OTHER DATA AVAILABLE QW	WL
--	--	--	D	121VERD	21.0	1150	A-16-03 34DDB		
--	--	--	--	--	--	--	A-16-03 35ACA		
--	--	--	--	121VERD	--	--	A-16-03 35ACD1		
--	--	--	--	121VERD	--	--	A-16-03 35ACD2		
--	--	--	--	121VERD	21.0	540	A-16-03 35ADC		
--	--	--	--	121VERD	--	--	A-16-03 35ADD1		
--	--	--	--	121VERD	--	--	A-16-03 35ADD2		
--	--	--	D	--	--	--	A-16-03 35CCA		
--	--	--	D	--	--	--	A-16-03 35CCC		
--	--	--	--	121VERD	--	--	A-16-03 35DAB1		
--	--	--	--	121VERD	--	--	A-16-03 35DAB2		I
30 V	09/01/1977	--	--	121VERD	20.5	500	A-16-03 35DAB3	I	
--	--	--	--	121VERD	--	--	A-16-03 35DBD1		
--	--	--	--	121VERD	--	--	A-16-03 35DBD2		
--	--	--	--	121VERD	--	--	A-16-03 35DBD3		
--	--	--	--	121VERD	--	--	A-16-03 35DCD		I
--	--	--	--	121VERD	--	--	A-16-03 35DDC	B	I
150 B	10/07/1979	--	D	121VERD	--	--	A-16-03 36CDC		
40 B	12/09/1974	160	D	121VERD	--	--	A-16-03 36DAC		I
75 R	05/16/1972	7	D	111ALVM	--	--	A-16-04 11CBA		
--	--	--	--	--	--	--	A-16-04 12ABC		
--	--	--	--	310SUPI	--	--	A-16-04 12BAA1	B	
--	--	--	--	--	--	--	A-16-04 12BAA2		
--	--	--	--	--	--	--	A-16-04 12BAD		
32 R F	09/25/1971	--	--	310SUPI	20.0	500	A-16-04 14CBD	B	
--	--	--	D	--	--	--	A-16-04 15DDC		
75	10/ /1958	--	--	310SUPI	21.0	547	A-16-04 15DDD	B	
--	--	--	G,J,N,U	121VERD	--	--	A-16-04 20BBB		I
70 R	1962	0	D	310SUPI	--	--	A-16-04 21AAC		
--	--	--	--	--	--	--	A-16-04 23ACB		
--	--	--	D	121VERD	--	--	A-16-04 23BBC		
50	11/ /1958	--	D	310SUPI	--	411	A-16-04 23BCA	B	
35	05/16/1974	95	D	121VERD	17.0	500	A-16-04 23CAB	A	
50 R	10/14/1958	--	--	310SUPI	20.5	556	A-16-04 23CAC	B	
20 R F	05/05/1970	--	D	121VERD	17.0	530	A-16-04 23DBB	A	
25 B	03/12/1975	247	--	--	--	--	A-16-04 25CCB		
50 R	05/16/1974	--	--	--	17.0	527	A-16-04 26DAC	B	
70 R F	05/21/1974	--	D	310SUPI	22.0	558	A-16-04 26DCC	B	
--	--	--	D	--	17.0	580	A-16-04 26DDC	A	
37 R	04/15/1974	209	D	121VERD	22.0	480	A-16-04 27DCC	I	
--	--	--	--	--	--	--	A-16-04 33AAB		
--	--	--	D	121VERD	--	--	A-16-04 33AAC		
40 M	05/17/1977	121	D	121VERD	22.0	720	A-16-04 34ABB	C	
--	--	--	D	111ALVM	--	500	A-16-04 34BCA	A	
--	--	--	D	121VERD	18.0	600	A-16-04 34BCB	A	
--	--	--	D	111ALVM	--	550	A-16-04 34BCD	A	
--	--	--	--	--	18.0	550	A-16-04 34BDA	A	
15 B	03/15/1975	--	D	121VERD	--	--	A-16-04 34BDB		
--	--	--	D	121VERD	18.0	490	A-16-04 34BDC	A	
--	--	--	--	121VERD	--	560	A-16-04 34BDD	A	
--	--	--	D	121VERD	--	--	A-16-04 35AAD		
--	--	--	--	121VERD	21.0	700	A-16-04 35BAD	A	
--	--	--	D	121VERD	20.0	1010	A-16-04 35BCC	A	
--	--	--	--	121VERD	22.0	900	A-16-04 35CAB	A	
--	--	--	--	121VERD	--	--	A-16-04 35CBC		
--	--	--	D	121VERD	18.0	980	A-16-04 35CCA1	A	
--	--	--	D	121VERD	--	--	A-16-04 35CCA2		
--	--	--	--	121VERD	--	--	A-16-04 35CCA3		
--	--	--	--	121VERD	20.0	950	A-16-04 35CCD	B	
--	--	--	D	121VERD	17.0	890	A-16-04 35CDC	A	
--	--	--	--	121VERD	--	--	A-16-04 35CDD		
--	--	--	D	121VERD	--	--	A-16-04 35DCB	B	
50 R	04/10/1972	--	D	330RDLL	18.5	300	A-16-05 11ACC	B	
69 R	07/ /1971	8	--	310SUPI	--	--	A-16-05 11BCA		
12 R	05/ /1972	--	--	310SUPI	--	--	A-16-05 11CBA		
--	--	--	--	310SUPI	--	--	A-16-05 13ADA		
150 R	04/ /1972	--	D	310SUPI	--	--	A-16-05 13BBD	I	
95 R	--	--	--	310SUPI	--	--	A-16-05 13BDC	I	
--	--	--	--	310SUPI	--	--	A-16-05 13CBA		
--	--	--	--	310SUPI	--	--	A-16-05 13DBD		
70 R	08/23/1972	--	--	310SUPI	--	--	A-16-05 13DDA		
--	--	--	--	310SUPI	--	--	A-16-05 14ACA		
15 V	09/08/1977	7	J,N,U	310SUPI	20.0	290	A-16-05 14DAD	I	C
--	--	--	--	310SUPI	19.0	350	A-16-05 14DBA	B	
11 R	05/ /1970	--	--	310SUPI	--	--	A-16-05 14DDA		
59 U	08/09/1974	0	D	310SUPI	20.5	260	A-16-05 14DDD	A	
--	--	--	--	310SUPI	--	--	A-16-05 24ABD		
30 E	01/16/1967	50	--	310SUPI	--	--	A-16-05 24ACD	I	
3 R	02/02/1960	--	D	310SUPI	--	--	A-16-05 36CAD		
--	--	--	--	310SUPI	16.5	--	A-16-06 08CCC	B	

LOCAL NUMBER	DATE COMPLETED	METHOD CONST-RUCTED	FINISH	CASING DIAM-ETER (INCHES)	DEPTH TO FIRST OPENING (FEET)	USE OF WATER	DEPTH OF WELL (FEET)	ALTITUDE OF LAND SURFACE (FEET)	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED
A-16-06 08CCD	1963	C	X	8	475	P	625	4265	445.90	S	01/16/1967
A-16-06 08CDA	10/ /1950	C	X	8	9	H	645	4300	484.00	R	10/20/1950
A-16-06 08CDC	1952	C	X	8	16	H,I	585	4240	453.00	R	04/10/1974
A-16-06 09CCA	01/ /1972	C	P	10	590	P	800	4390	560.00	R	01/06/1972
A-16-06 17ABB	12/26/1972	C	P	8	446	H	750	4280	528.00	R	12/26/1972
A-16-06 17BAB	1953	C	X	8	12	H	520	4220	430.00	R	04/10/1974
A-16-06 17CAA	1954	C	X	8	20	H	625	4220	400.00	R	05/23/1974
A-16-06 17CBA	08/ /1972	P	X	8	310	H	580	4165	409.00	S	08/ /1972
A-16-06 17CBB1	1950	C	X	8	40	U	530	4170	417.40	T	04/26/1974
A-16-06 17CBB2	1960	C	--	8	--	H	500	4160	384.10	S	12/14/1960
A-16-06 17CBD	10/07/1973	P	X	6	443	H	550	4170	414.00	S	11/01/1973
A-16-06 18BBC	--	C	--	8	--	P	500	4140	375.00	R	08/23/1972
A-16-06 18CDB	--	C	--	8	--	P	421	4075	354.71	S	12/14/1960
A-16-06 18DDD	08/07/1967	P	F	5	443	H	523	4175	410.00	R	08/07/1967
A-16-06 19BAB	1965	C	P	6	--	H	580	4060	480.00	R	1965
A-16-06 19BBC	1956	C	X	6	--	H	480	4010	329.00	S	11/ /1972
A-16-06 19BCC	1971	C	X	6	20	H	350	4000	288.10	S	05/04/1972
A-16-06 19BCD	1961	C	X	8	15	P	360	4040	300.20	S	01/16/1967
A-16-06 19CDC	05/ /1970	P	X	6	19	S	390	4100	322.00	R	05/ /1970
A-16-08 10ABC	09/08/1977	--	P	6.62	7	--	59	7470	6.69	S	09/03/1978
A-16-09 10CCC1	12/10/1976	--	P	12	25	H	47	7845	30.00	R	12/10/1976
A-16-09 10CCC2	--	--	--	7.50	--	--	--	7845	--		--
A-16-09 28CBA	1944	--	--	8	--	P	125	7497	41.97	S	09/22/1966
A-16-09 28CBC	07/ /1961	C	--	8	38	P	97	7495	39.44	S	09/22/1966
A-17-01 13C UNSURV	1951	C	--	6.62	--	U	200	4300	--		--
A-17-01 15C UNSURV	07/ /1971	--	P	6.62	422	S	530	4540	430.00	P	07/ /1971
A-17-01 31B UNSURV	09/30/1973	C	P	6.62	335	S	435	5055	345.00	R	10/10/1973
A-17-03 33BDA	12/04/1973	--	--	6.62	215	H	240	3540	145.00	R	12/04/1973
A-17-03 33BDC1	--	--	--	8.62	--	H	--	3475	58.90	T	03/23/1978
A-17-03 33BDC2	07/ /1977	--	--	6.62	--	H	130	3475	66.60	S	03/16/1978
A-17-03 35ACC	--	C	--	6	--	S	450	3790	400.00	R	05/01/1959
A-17-04 03AAC1	06/ /1964	C	X	--	--	U	340	4480	--		--
A-17-04 03AAC2	01/ /1969	H	X	7	827	U	1242	4480	--		--
A-17-04 04BBD1	06/01/1964	C	X	10	104	U	1294	4415	--		--
A-17-04 04BBD2	05/ /1964	C	P	12	1713	U	1958	4415	--		--
A-17-04 04BCA	11/ /1961	--	--	--	--	U	1718	4410	--		--
A-17-04 05CAA	10/ /1964	--	X	10	108	U	1663	4365	733.00	S	03/19/1974
A-17-04 07DAD	--	--	--	--	--	U	360	4235	--		--
A-17-04 15CDC	--	C	--	6	--	S,H	505	4070	466.20	T	04/03/1978
A-17-04 25BAA	11/ /1969	P	P	6	506	H	546	4060	492.00	S	03/19/1974
A-17-05 01DBA	1957	C	--	12	--	U	600	4445	472.60	S	10/10/1973
A-17-05 01DBC1	1957	C	--	8	--	U	600	4460	--		--
A-17-05 01DBC2	04/25/1971	C	P	6.62	540	H	640	4470	560.20	S	03/13/1974
A-17-05 01DCD	04/ /1970	C	P	6.62	530	H	610	4445	530.00	R	04/10/1970
A-17-05 03DBC	1951	C	X	8	207	U	845	4620	746.00	R	07/ /1966
A-17-05 05BDC	05/22/1976	C	P	12.75	969	I	1209	4650	917.00	R	05/22/1976
A-17-05 08BCB	05/ /1969	H	X	7	1060	U	1195	4430	723.00	S	03/07/1975
A-17-05 10CAB	1951	C	X	8	700	U	714	4480	653.00	L	02/26/1975
A-17-05 10DCA	1954	C	--	8	--	U	710	4440	575.10	S	12/15/1960
A-17-05 11CCC	08/28/1975	C	P	10	600	P	791	4380	535.00	T	09/28/1975
A-17-05 11CDB	1962	C	--	8	--	P	735	4415	568.40	S	04/22/1975
A-17-05 11DCC1	07/ /1946	--	--	--	--	U	268	4390	--		--
A-17-05 11DCC2	--	--	--	8	--	U	177	4390	129.40	T	02/08/1974
A-17-05 11DDD	1949	C	--	8	--	H	528	4410	478.30	S	03/13/1974
A-17-05 12BBD	1961	C	P	6	540	P	735	4590	689.00	R	08/09/1968
A-17-05 12CCD	--	--	--	6	--	P	526	4395	366.40	S	05/08/1974
A-17-05 12DCC	1948	C	P	8	500	P	615	4410	470.50	S	04/18/1974
A-17-05 13ABB	1964	C	X	8	500	P	595	4410	459.50	S	04/18/1974
A-17-05 14ABD	1951	C	P	8	--	P	700	4360	474.80	S	04/18/1974
A-17-05 14BCD	1973	C	P	6	478	H	538	4320	451.60	S	03/13/1974
A-17-05 15AAB	1949	C	X	8	3	P	700	4375	497.30	S	04/22/1975
A-17-05 15ABD	--	C	P	8	572	U	605	4385	500.09	T	10/24/1973
A-17-05 15ADC	--	--	--	--	--	U	750	4390	--		--
A-17-05 16CAD	05/ /1971	C	X	6	858	U	1015	4410	600.00	R	06/ /1971
A-17-05 19AAA	01/ /1973	P	X	8	25	P	647	4090	449.50	S	02/27/1974
A-17-05 19ABD	1972	P	X	8	18	U	628	4045	407.20	L	02/27/1975
A-17-05 24ADA	02/15/1960	C	P	7	75	U	135	4130	54.00	R	02/15/1960
A-17-05 24CCC	--	--	P	6	220	U	240	4030	143.50	S	04/10/1974
A-17-05 24CCD	--	--	--	--	--	H	--	4030	--		--
A-17-05 24CDC	1955	C	--	6	--	H,S	490	4050	100.00	R	05/21/1957
A-17-05 24CDD1	1970	C	--	6	--	H	125	4030	--		--
A-17-05 25AAA	1955	--	X	8	70	P	750	4400	596.20	T	01/13/1967
A-17-05 25BBB	--	--	--	--	--	H	--	4430	--		--
A-17-05 25BBD	1951	C	X	8	40	U	284	4075	209.60	S	01/16/1967
A-17-05 25BDB	--	--	--	6	--	H,I	350	4020	110.00	S	04/23/1974
A-17-05 26ACC	--	--	X	6	30	H	300	4010	60.00	S	05/09/1972
A-17-05 26BAB1	10/ /1971	C	X	8	10	H	150	4000	68.50	S	04/17/1974
A-17-05 26BAB2	1972	C	X	6	10	H	97	4000	56.00	R	1972
A-17-05 26BAB3	1972	C	X	6	10	--	125	3980	--		--
A-17-05 26BAC1	1972	C	X	6	10	U	113	3990	48.00	R	1972

DISCHARGE (GALLONS PER MINUTE)	DATE DISCHARGE MEASURED	DRAW-DOWN (FEET)	TYPES OF LOGS AVAILABLE	PRINCIPAL AQUIFER	TEMPERATURE (DEGREES °C)	SPECIFIC CONDUCTANCE (UMHOS/CM AT 25° C)	LOCAL NUMBER	OTHER DATA AVAILABLE GW	WL
20 R	01/16/1967	115	D	310SUPI	--	--	A-16-06 08CCD	B	
20	10/20/1950	0	D	310SUPI	--	--	A-16-06 08CDA		
--	--	--	--	310SUPI	16.0	360	A-16-06 08CDC	A	
--	--	--	--	310SUPI	--	--	A-16-06 09CCA	I	
--	--	--	D	310SUPI	--	--	A-16-06 17ABB		
--	--	--	--	310SUPI	17.5	350	A-16-06 17BAB	A	
--	--	--	--	310SUPI	--	--	A-16-06 17CAA		
11 R	08/ /1972	--	--	310SUPI	--	--	A-16-06 17CBA		
--	--	--	--	310SUPI	--	--	A-16-06 17CBB1		A
--	--	--	--	310SUPI	20.0	350	A-16-06 17CBB2	A	
14	11/01/1973	--	D	310SUPI	19.5	240	A-16-06 17CBD	B	
225 R	08/23/1972	18	--	310SUPI	17.5	300	A-16-06 18BBC	I	
60 R	12/14/1960	0	--	310SUPI	--	--	A-16-06 18CDB	I	
12 R	08/07/1967	--	--	310SUPI	--	--	A-16-06 18DDD		
--	--	--	--	310SUPI	--	--	A-16-06 19BAB		
--	--	--	--	310SUPI	18.5	280	A-16-06 19BBC	A	
--	--	--	--	310SUPI	--	--	A-16-06 19BCC		
17	01/16/1967	--	--	310SUPI	--	--	A-16-06 19BCD	I	
20	05/ /1970	--	--	310SUPI	--	--	A-16-06 19CDC		
--	--	--	D	120VLCC	--	--	A-16-08 10ABC		
8 R	12/10/1976	15	D	120VLCC	--	--	A-16-09 10CCC1		
--	--	--	--	--	--	--	A-16-09 10CCC2		
--	--	--	--	--	--	--	A-16-09 28CBA		
25 R	09/22/1966	3	D	120VLCC	--	--	A-16-09 28CBC	B	
--	--	--	--	--	--	--	A-17-01 13C UNSURV		
15 B	07/ /1971	--	D	341MRTN	--	--	A-17-01 15C UNSURV		
8 B	09/30/1973	0	D	341MRTN	17.5	700	A-17-01 31B UNSURV	B	
--	--	--	D	121VERD	--	--	A-17-03 33BDA		
--	--	--	--	121VERD	--	--	A-17-03 33BDC1		
--	--	--	--	121VERD	--	510	A-17-03 33BDC2		
--	--	--	--	--	--	--	A-17-03 35ACC		
--	--	--	--	121VERD	--	--	A-17-04 03AAC1		
--	--	--	D	121VERD	--	--	A-17-04 03AAC2		
--	--	--	--	121VERD	--	--	A-17-04 04BBD1		
--	--	--	J,I	--	--	--	A-17-04 04BBD2		
--	--	--	G	121VERD	--	--	A-17-04 04BCA		
--	--	--	I,J	330RDLL	--	--	A-17-04 05CAA		
--	--	--	--	--	--	--	A-17-04 07DAD		
--	--	--	--	310SUPI	--	900	A-17-04 15CDC	I	
50 R	03/19/1974	37	--	310SUPI	--	--	A-17-04 25BAA		
--	--	--	--	310SUPI	--	--	A-17-05 01DBA		
--	--	--	--	310SUPI	11.0	460	A-17-05 01DBC1	A	
--	--	--	D	310SUPI	20.0	600	A-17-05 01DBC2	B	
22	04/10/1970	--	D	310SUPI	19.0	760	A-17-05 01DCD	A	
11 R	07/ /1976	--	--	310SUPI	16.5	526	A-17-05 03DBC	B	
--	--	--	G	341MRTN	18.0	475	A-17-05 05BDC		
--	--	--	G	341MRTN	--	--	A-17-05 08BCB		
12	--	--	C,J,U	330RDLL	--	--	A-17-05 10CAB	B	
--	--	--	--	310SUPI	18.0	604	A-17-05 10DCA	B	
1078 D	09/24/1975	21	D	330RDLL	19.0	600	A-17-05 11CCC		
50 C	04/22/1975	1	D	310SUPI	--	476	A-17-05 11CDB	I	
--	--	--	G	310SUPI	--	--	A-17-05 11DCC1		
--	--	--	--	310SUPI	--	--	A-17-05 11DCC2		T
--	--	--	--	310SUPI	18.0	320	A-17-05 11DDD	B	
26 R	08/09/1968	--	--	310SUPI	--	--	A-17-05 12BBD	I	
--	--	--	--	310SUPI	--	286	A-17-05 12CCD	I	
70	04/18/1974	--	--	310SUPI	--	--	A-17-05 12DCC	B	
90	04/18/1974	--	D	310SUPI	14.0	310	A-17-05 13ABB	A	
67 R	04/18/1974	20	--	310SUPI	--	286	A-17-05 14ABD	I	
30	03/13/1974	--	--	310SUPI	18.0	290	A-17-05 14BCD	A	
118 C	04/22/1975	1	--	310SUPI	--	278	A-17-05 15AAB	I	
--	--	--	J,N,U	310SUPI	--	--	A-17-05 15ABD	B	C
--	--	--	--	310SUPI	--	476	A-17-05 15ADC	I	
--	--	--	D	341MRTN	--	--	A-17-05 16CAD		
87 C	02/27/1974	5	D	310SUPI	20.0	325	A-17-05 19AAA	B	
--	--	--	D,J,N,U	310SUPI	--	--	A-17-05 19ABD		
40 R	02/15/1960	0	D	310SUPI	--	--	A-17-05 24ADA	I	
--	--	--	D	310SUPI	--	--	A-17-05 24CCC		
--	--	--	--	--	--	--	A-17-05 24CCD		
--	--	--	--	310SUPI	15.5	510	A-17-05 24CDC	B	
10 R	--	--	D	310SUPI	--	--	A-17-05 24CDD1		
22 R	01/13/1967	23	--	310SUPI	--	--	A-17-05 25AAA	I	I
--	--	--	--	310SUPI	--	--	A-17-05 25BBB		
--	--	--	J,N,U	330RDLL	16.0	--	A-17-05 25BBD	I	T
--	--	--	--	310SUPI	13.0	420	A-17-05 25BDB	A	
--	--	--	--	310SUPI	--	--	A-17-05 26ACC		
--	--	--	D	310SUPI	11.5	700	A-17-05 26BAB1	A	
--	--	--	--	310SUPI	--	--	A-17-05 26BAB2	B	
--	--	--	--	310SUPI	--	--	A-17-05 26BAB3		
--	--	--	--	310SUPI	--	--	A-17-05 26BAC1		

LOCAL NUMBER	DATE COMPLETED	METHOD CONSTRUCTED	FINISH	CASING DIAMETER (INCHES)	DEPTH TO FIRST OPENING (FEET)	USE OF WATER	DEPTH OF WELL (FEET)	ALTITUDE OF LAND SURFACE (FEET)	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED
A-17-05 26BAC2	1973	C	X	6	10	--	118	3975	58.00	R	1973
A-17-05 26BAD	1956	C	X	10	180	P	200	4000	49.55	S	07/22/1974
A-17-05 26BBA1	11/ /1973	C	X	6	15	H	133	4010	60.00	R	11/ /1973
A-17-05 26BBA2	07/22/1974	C	X	6	10	U	120	4000	55.20	S	07/22/1974
A-17-05 26BBB	06/ /1965	C	X	9	19	I	200	4035	150.00	R	04/ /1974
A-17-05 26BBD1	08/ /1974	C	X	6	10	U	130	4000	56.00	R	08/ /1974
A-17-05 26BBD2	09/ /1974	C	X	6	10	U	108	4000	--		--
A-17-05 26BCA	1970	C	P	6	60	P	126	4000	60.00	R	1970
A-17-05 26BCC1	1965	C	X	10	15	U	130	3975	46.00	R	--
A-17-05 26BCC2	10/ /1974	C	X	6	10	H	140	4005	85.00	S	04/15/1975
A-17-05 26BDB1	1960	C	--	6	--	P	145	3980	40.00	R	--
A-17-05 26BDB2	10/19/1973	C	P	6.62	113	P	132	3980	40.00	R	--
A-17-05 26CAA1	--	--	--	--	--	P	190	4000	--		--
A-17-05 26CAA2	1966	C	P	8	76	U	126	3955	19.50	S	01/06/1967
A-17-05 27CCD1	1973	C	P	6.50	340	H	520	4045	340.00	R	1973
A-17-05 27CDC	--	C	X	6	--	U	380	4000	340.00	R	1954
A-17-05 27DAA	1972	C	X	6	340	H	370	3970	50.00	R	1972
A-17-05 27DAB1	02/ /1973	C	X	10	10	U	402	3960	68.20	S	04/17/1974
A-17-05 27DAB2	03/04/1973	C	P	5	70	H	100	3960	60.00	R	04/17/1974
A-17-05 27DAB3	03/ /1973	C	--	--	--	U	100	3960	--		--
A-17-05 27DAB4	1950	C	X	6	20	H	365	3970	315.00	R	05/08/1972
A-17-05 27DAB5	02/ /1974	C	P	5	85	H	340	3970	201.00	S	04/17/1974
A-17-05 27DAB6	1950	C	X	8	35	H	150	3965	48.40	S	05/08/1972
A-17-05 27DAC	10/ /1971	C	X	6	90	H	150	3940	61.00	R	10/ /1971
A-17-05 27DBA1	1968	P	P	--	42	H	430	3990	341.20	S	05/08/1972
A-17-05 27DBA2	--	C	X	6	20	H	210	3980	118.30	S	12/15/1960
A-17-05 27DBA3	1973	C	P	6	90	H	147	3980	87.50	S	03/14/1974
A-17-05 27DBD1	05/ /1970	C	X	6	110	H	150	3960	90.00	S	05/ /1970
A-17-05 27DBD2	--	--	P	6	--	H	550	3970	340.00	R	04/17/1974
A-17-05 27DBD3	--	--	--	6	--	H	110	3965	60.00	R	12/14/1971
A-17-05 27DDB	1950	C	P	6	--	U	425	3960	--		--
A-17-05 29BAA	08/ /1960	C	X	6	6	H	510	4050	451.30	S	05/09/1972
A-17-05 29BAB	05/05/1972	C	P	6	410	H	620	4080	480.00	R	05/08/1972
A-17-05 29BAC	01/ /1973	C	P	6	435	H	500	4040	402.00	R	01/ /1973
A-17-05 29BAD	1955	C	X	8	20	H	470	4015	396.60	T	05/08/1972
A-17-05 29BBD	02/ /1974	C	P	6	455	H	495	4050	442.60	S	04/23/1974
A-17-05 29BCA	--	--	X	8	10	--	520	4035	406.00	R	--
A-17-05 32DAC	1953	C	--	8	--	H,S	480	3830	214.40	S	05/08/1972
A-17-05 33ACA	01/ /1956	C	P	6	310	H	350	3910	265.10	S	05/08/1972
A-17-05 33ADA1	02/ /1974	C	--	--	--	P	700	3860	212.20	S	07/22/1974
A-17-05 33ADA2	07/ /1974	H	--	--	--	--	500	3860	211.70	R	07/18/1974
A-17-05 33BCB	1954	C	P	6.62	300	H	365	3930	293.15	S	05/08/1972
A-17-05 34AAA	1951	C	--	8	--	H	325	3950	168.20	S	12/16/1960
A-17-05 34BAA1	--	--	X	6	80	H	325	3960	--		--
A-17-05 34BAA2	--	--	--	8	--	U	--	3940	120.00	S	06/26/1974
A-17-05 34BCC	04/29/1969	H	X	7	1051	U	1405	3900	274.30	S	07/18/1974
A-17-05 34BDC	1955	C	X	--	20	U	500	3885	440.00	R	04/17/1974
A-17-05 35CDA	1955	D	--	72	--	T	30	4020	--		--
A-17-05 35CDD	1952	C	X	8	20	U	850	4060		D	1952
A-17-05 35DAC	04/ /1965	--	X	6	571	T	750	4040	370.00	S	05/08/1974
A-17-05 36CCA	1954	C	--	8	--	U	600	4110	414.15	S	05/23/1957
A-17-05 36CDB	11/ /1974	C	X	6.62	702	H	735	4110	437.00	R	11/12/1974
A-17-06 05CDD	--	--	--	--	--	U	189	4320	69.20	S	04/03/1975
A-17-06 06DCA	05/23/1969	--	P	10.75	500	U	800	4450	464.00	T	05/14/1974
A-17-06 07DDA1	--	--	--	5	--	H	24	4195	16.00	S	01/13/1967
A-17-06 07DDA2	--	--	--	6	--	H	128	4210	26.00	S	07/17/1974
A-17-06 08BAA	02/23/1977	C	X	8.62	110	H	335	4260	66.00	R	03/07/1977
A-17-06 08CCD	1960	C	P	7	--	P	560	4230	182.90	S	01/13/1967
A-17-06 08BDB	02/15/1969	--	X	7	92	U	215	4245	61.20	S	08/23/1974
A-17-06 18ABA	01/ /1967	C	P	6	207	H	257	4220	200.00	R	01/13/1967
A-17-06 18ADD1	1960	C	X	6	320	P	500	4240	278.00	S	04/22/1975
A-17-06 18ADD2	1964	C	P	6	--	H	350	4245	--		--
A-17-06 18DAB	1947	C	P	4	75	U	150	4180	140.00	R	1947
A-17-06 19BAC	1951	C	--	8	160	U	180	4140	40.23	S	05/23/1957
A-17-06 19BBC1	1949	D	--	--	--	P	25	4120	14.00	S	05/15/1974
A-17-06 19BBC2	1959	C	--	5	--	H	350	4195	299.00	S	01/13/1967
A-17-06 19BCB	--	D	C	48	--	U	18	4110	13.00	S	01/16/1967
A-17-06 30ABC	--	C	X	10	--	U	850	4335	482.70	T	01/13/1967
A-17-06 30BBB	1951	H	--	8	--	U	465	4300	437.50	S	12/14/1960
A-17-07 04DDD	--	C	P	6	--	S	90	6320	41.00	S	04/13/1978
A-17-07 11BAC	--	A	--	--	--	--	400	6340		D	--
A-17-07 11BCB	1970	P	P	6.62	--	H	315	6330	220.00	T	04/12/1978
A-17-07 11CAB	09/ /1972	C	X	--	--	U	--	6320		D	09/ /1972
A-18-02 25BCB	06/ /1966	C	X	6	621	S	726	4320	630.00	R	07/21/1966
A-18-02 31DCC	02/ /1951	C	X	14	130	I	285	3860	25.00	R	02/ /1951
A-18-04 15DBC	1961	C	X	6	20	H	1300	4740	400.00	R	03/05/1974
A-18-04 25BCB	1950	C	X	8	5	H	1120	4760	760.00	R	06/02/1967
A-18-04 27DBB	1962	C	X	5	--	H	300	4540	200.00	R	1962
A-18-04 29CDA	1890	--	--	8	--	U	1400	4400	800.00	R	10/10/1958
A-18-04 32CAA	06/ /1964	H	--	16	--	U	304	4460	--		--

DISCHARGE (GALLONS PER MINUTE)	DATE DISCHARGE MEASURED	DRAW-DOWN (FEET)	TYPES OF LOGS AVAILABLE	PRINCIPAL AQUIFER	TEMPERATURE (DEGREES °C)	SPECIFIC CONDUCTANCE (UMHOS/CM AT 25° C)	LOCAL NUMBER	OTHER DATA AVAILABLE QW	WL
--	--	--	--	310SUPI	--	--	A-17-05 26BAC2		
--	--	--	--	310SUPI	--	--	A-17-05 26BAD	I	
--	--	--	--	310SUPI	--	--	A-17-05 26BBA1		
--	--	--	--	310SUPI	--	--	A-17-05 26BBA2		
60 B	06/ /1965	--	D	310SUPI	16.0	610	A-17-05 26BBB	A	
--	--	--	--	310SUPI	--	--	A-17-05 26BBD1		
--	--	--	--	310SUPI	--	--	A-17-05 26BBD2		
65 B	1970	100	--	310SUPI	--	--	A-17-05 26BCA		
--	--	--	--	310SUPI	--	--	A-17-05 26BCC1		
--	--	--	--	310SUPI	--	--	A-17-05 26BCC2		
--	--	--	--	310SUPI	--	--	A-17-05 26BDB1	I	
--	--	--	D	310SUPI	--	--	A-17-05 26BDB2		
--	--	--	--	310SUPI	18.5	500	A-17-05 26CAA1	I	
--	--	--	D	310SUPI	--	--	A-17-05 26CAA2		I
17 B	1973	10	D	310SUPI	--	--	A-17-05 27CCD1		
--	--	--	--	310SUPI	--	--	A-17-05 27CDC		
20 B	1972	--	D	310SUPI	--	--	A-17-05 27DAA		
8 B	02/ /1973	--	D	310SUPI	--	--	A-17-05 27DAB1		
11 B	03/04/1973	--	D	310SUPI	16.0	710	A-17-05 27DAB2	A	
--	--	--	D	--	--	--	A-17-05 27DAB3		
--	--	--	--	310SUPI	--	--	A-17-05 27DAB4		
--	--	--	--	310SUPI	16.0	600	A-17-05 27DAB5	B	
--	--	--	--	310SUPI	14.5	500	A-17-05 27DAB6		
24 B	10/ /1971	--	D	310SUPI	14.0	600	A-17-05 27DAC	A	
--	--	--	--	310SUPI	--	425	A-17-05 27DBA1	B	
--	--	--	--	310SUPI	--	600	A-17-05 27DBA2		
6 R	03/14/1974	--	--	310SUPI	10.0	710	A-17-05 27DBA3	A	
55 B	05/ /1970	0	D	310SUPI	--	--	A-17-05 27DBD1		
--	--	--	--	310SUPI	11.0	680	A-17-05 27DBD2	B	
20 R	12/14/1971	--	--	310SUPI	--	645	A-17-05 27DBD3	I	
--	--	--	--	310SUPI	--	--	A-17-05 27DDB		
--	--	--	--	310SUPI	--	--	A-17-05 29BAA		
9 R	05/08/1972	--	D	310SUPI	--	--	A-17-05 29BAB		
26 B	01/ /1973	--	D	310SUPI	--	--	A-17-05 29BAC		
--	--	--	--	310SUPI	--	--	A-17-05 29BAD		I
7 B	02/ /1974	0	D	310SUPI	13.5	420	A-17-05 29BBD	A	
25	--	--	--	310SUPI	--	--	A-17-05 29BCA		
--	--	--	--	310SUPI	--	--	A-17-05 32DAC		
--	--	--	--	310SUPI	16.5	667	A-17-05 33ACA	B	
708	07/22/1974	43	D	330RDLL	--	--	A-17-05 33ADA1		
--	--	--	--	310SUPI	--	--	A-17-05 33ADA2		
15 B	06/20/1955	--	D	310SUPI	--	--	A-17-05 33BCB	B	
--	--	--	--	310SUPI	17.0	580	A-17-05 34AAA	B	I
20 B	--	--	--	310SUPI	--	--	A-17-05 34BAA1		
--	--	--	--	310SUPI	--	--	A-17-05 34BAA2		
--	--	--	G	310SUPI	--	--	A-17-05 34BCC		
--	--	--	D	310SUPI	--	--	A-17-05 34BDC		
--	--	--	--	--	--	--	A-17-05 35CDA		
--	--	--	--	--	--	--	A-17-05 35CDD		
46 B	05/08/1974	0	D	310SUPI	13.0	350	A-17-05 35DAC	A	
--	--	--	--	310SUPI	--	--	A-17-05 36CCA		
10 R	11/12/1974	0	D	330RDLL	--	--	A-17-05 36CDB	B	
--	--	--	--	310SUPI	--	--	A-17-06 05CDD		
--	--	--	D,J,U,N	310SUPI	20.0	550	A-17-06 06DCA	B	
--	--	--	--	111ALVM	--	--	A-17-06 07DDA1		
--	--	--	--	310SUPI	--	--	A-17-06 07DDA2		
180 O	03/07/1977	196	G	330RDLL	15.0	340	A-17-06 08BAA	B	
75 R	01/13/1967	--	--	310SUPI	--	--	A-17-06 08BCD	I	
--	--	--	D	310SUPI	--	--	A-17-06 08BDB		
--	--	--	D	310SUPI	--	--	A-17-06 18ABA		
142 M	04/22/1975	5	--	310SUPI	--	410	A-17-06 18ADD1	I	
--	--	--	D	310SUPI	--	--	A-17-06 18ADD2		
5 R	1947	5	D	310SUPI	--	--	A-17-06 18DAB		
--	--	--	--	310SUPI	15.0	424	A-17-06 19BAC	B	I
--	--	--	--	111ALVM	--	--	A-17-06 19BBC1		
19 R	01/13/1967	20	--	310SUPI	--	--	A-17-06 19BBC2	I	
--	--	--	--	111ALVM	--	--	A-17-06 19BCB		
10	01/13/1967	30	D,J,N,U	310SUPI	--	--	A-17-06 30ABC		I
--	--	--	--	310SUPI	15.5	343	A-17-06 30BBB	B	A
1	04/13/1978	--	D	120VLCC	--	--	A-17-07 04DDD		
--	--	--	--	--	--	--	A-17-07 11BAC		
--	--	--	--	--	--	--	A-17-07 11BCB		
--	--	--	--	--	--	--	A-17-07 11CAB		
17 B	06/ /1966	30	D	310SUPI	--	--	A-18-02 25BCB		
--	--	--	D	310SUPI	--	--	A-18-02 31DCC		
6 R	03/05/1974	--	D	310SUPI	10.0	900	A-18-04 15DBC	B	
10	10/10/1958	--	--	--	16.6	665	A-18-04 25BCB	B	
1	1962	--	--	310SUPI	--	--	A-18-04 27DBB		
--	--	--	--	--	--	--	A-18-04 29CDA		
--	--	--	--	--	--	--	A-18-04 32CAA		

LOCAL NUMBER	DATE COMPLETED	METHOD CONST-RUCTED	FINISH	CASING DIAM-ETER (INCHES)	DEPTH TO FIRST OPENING (FEET)	USE OF WATER	DEPTH OF WELL (FEET)	ALTITUDE OF LAND SURFACE (FEET)	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED
A-18-04 34ABB	1971	H	X	9	90	U	3203	4480	329.20	S	08/22/1974
A-18-05 27ABB	1949	C	X	8	20	P	1200	4700	707.75	S	06/02/1967
A-18-05 27ABC	--	--	--	--	--	T	1200	4650	--		--
A-18-05 28ADA	08/08/1968	C	--	4	--	U	1308	4665	688.40	S	03/07/1975
A-18-05 29ADC	03/ /1964	C	X	6	480	H	852	4555	676.00	S	05/31/1967
A-18-05 31BCD	1965	C	P	6	1000	H	1050	4600	925.40	T	03/19/1974
A-18-05 31DDB	02/ /1969	C	X	5	1071	U	1215	4540	850.00	R	04/09/1969
A-18-05 34BAC	1969	H	X	10	51	U	1217	4480	--		--
A-18-05 34BCA1	12/ /1968	H	P	4	1051	U	1150	4450	--		--
A-18-05 34BCA2	11/ /1968	H	P	4	1135	U	1138	4450	--		--
A-18-05 34BCA3	11/ /1968	H	X	6	50	U	500	4450	--		--
A-18-06 04BBD	07/26/1966	C	X	8	295	P	380	5320		F	10/16/1973
A-18-06 04BCC	1967	C	P	8	320	P	380	5220	29.00	R	07/24/1974
A-18-06 17ACD	12/ /1970	C	X	8	510	U	600	4925	493.00	S	06/19/1974
A-18-06 21ACC	--	--	--	8	--	H	100	4790	--		--
A-18-06 21BBA	1958	C	F	8	--	P	90	4790	15.00	R	1958
A-18-06 21DBA1	--	--	--	6	--	H	100	4800	--		--
A-18-06 21DBA2	1973	C	P	6	68	H	100	4780	55.00	R	10/16/1973
A-18-06 21DBA3	--	--	--	6	--	H	100	4765	--		--
A-18-06 21DBA4	--	--	--	6	--	H	100	4765	--		--
A-18-06 21DBB	09/ /1973	C	P	6	65	H	100	4770	56.15	S	10/16/1973
A-18-06 21DCA	11/ /1966	C	P	8	57	U	266	4750	48.50	S	07/10/1974
A-18-06 27CAC1	05/ /1966	C	X	6	20	H	280	4700	140.00	R	05/27/1966
A-18-06 27CAC2	07/13/1973	C	X	8	14	H	175	4620	30.00	R	07/13/1973
A-18-06 27CBA1	--	C	X	8	39	H	138	4605	--		--
A-18-06 27CBA2	07/19/1973	C	X	6	54	H	100	4605	14.00	S	06/24/1974
A-18-06 33ADD	03/ /1972	C	X	4	--	H	135	4580	70.00	R	03/ /1972
A-18-06 34BBA	1973	C	P	5	152	H	176	4550	155.00	R	06/26/1973
A-18-07 08DDC	11/17/1973	C	P	7	771	U	1480	6490	732.80	T	01/30/1978
A-18-07 15CCB1	--	--	--	20	--	--	--	6450	212.20	T	01/30/1978
A-18-07 15CCB2	--	--	X	12	112	--	232	6450	101.04	S	07/22/1965
A-18-07 15CCB3	06/ /1965	H	P	14	75	--	205	6450	98.45	T	07/22/1965
A-18-07 15CCC1	1958	C	P	10	110	P	200	6435	117.90	S	01/11/1967
A-18-07 15CCC2	07/02/1977	H	P	6	1189	P	1252	6435	711.30	T	09/01/1977
A-18-07 15CCC3	12/ /1974	P	P	6.62	174	P	342	6435	160.00	R	12/ /1974
A-18-07 15CCC4	06/04/1976	P	P	6.62	187	P	320	6435	170.00	R	06/04/1976
A-18-07 16BCD1	--	--	--	--	--	--	--	6470	11.50	T	01/30/1978
A-18-07 16BCD2	08/14/1971	--	P	6.62	20	H	198	6465	70.70	T	01/30/1978
A-18-07 16BDB	--	D	W	--	--	--	19	6470	8.25	S	01/11/1967
A-18-07 16DAC1	10/ /1969	--	X	8.75	159	--	312	6440	161.00	T	01/30/1978
A-18-07 16DAC2	10/ /1969	--	--	8.75	--	U	200	6440	149.80	T	01/30/1978
A-18-07 16DBB	1976	--	X	8	285	P,H	300	6450	250.00	R	12/ /1977
A-18-07 16DBC	07/25/1972	H	P	10	175	--	388	6450	213.65	S	04/17/1974
A-18-07 16DDB	02/26/1972	C	P	8.62	150	U	190	6445	159.40	S	01/30/1978
A-18-07 22ABC	01/ /1973	A	--	--	--	--	312	6455	--		--
A-18-07 22BAA1	01/ /1973	--	P	12.75	132	P	252	6455	141.00	R	01/ /1973
A-18-07 22BAA2	10/31/1977	B	P	12	904	P	1330	6455	713.00	T	10/31/1977
A-18-07 22BAB	06/ /1965	H	--	--	--	I	200	6450	108.40	S	01/11/1967
A-18-07 27CBA	--	C	--	8.62	--	P	400	6485	332.10	T	02/01/1978
A-18-07 27CBB	09/ /1965	C	P	6	540	--	1500	6470	1279.00	T	09/07/1965
A-18-09 06BBD	05/ /1961	C	X	8	53	U	300	7240		D	05/ /1961
A-18-09 28BCB	07/ /1963	C	--	8	--	P	39	7110	--		--
A-18-09 28BDA	--	C	P	6	60	P	75	7115	20.00	R	--
A-18-09 28CAD	01/20/1972	C	P	8	100	H	120	7120	76.00	R	01/20/1972
A-18-09 28DBD	11/ /1970	C	P	7	18	H	52	7115	17.00	R	11/ /1970
A-18-09 28DDA1	--	D	W	48	0	U	11	7120	1.50	S	04/24/1978
A-18-09 28DDA2	1935	D	--	30	--	U	--	7125	2.10	S	04/24/1978
A-18-09 29CAA	--	--	P	8	--	H	65	7125	30.00	R	1966
A-18-09 29CAC	08/21/1969	P	P	6	39	P	101	7130	36.00	R	08/21/1969
A-18-09 29DAC	09/ /1972	B	F	36	18	P	30	7115	15.00	R	09/ /1972
A-18-09 29DDB	07/08/1974	C	P	8.63	21	P	45	7115	2.70	SX	04/24/1978
A-19-01 33BBD	1915	--	--	--	--	H,S	585	4460	561.00	R	--
A-19-06 14WBDC	11/27/1978	A	P	8.62	905	H,N	1105	6490	830.00	T	10/27/1978
A-19-06 17DAC	--	--	--	--	--	U	3253	7045		D	--
A-19-06 27ABB	07/15/1975	P	G	6.63	216	P	342	5540	9.00	R	07/15/1975
A-19-06 34DCB	1963	--	--	6	--	H	90	5300		F	10/16/1973
A-19-07 01DDD	08/23/1976	--	X	9.62	405	--	3512	7175	420.00	T	08/23/1976
A-19-07 20BBB	1965	H	X	--	--	--	400	6710		D	1965
A-19-07 20CBA	09/ /1970	A	X	--	--	H	485	6725	484.00	R	09/ /1970
A-20-04 04DCC1	1955	C	--	8	--	P	70	6660	--		--
A-20-05 24BBD	06/ /1965	C	--	14	--	--	3781	7240	1096.50	T	09/09/1966
A-20-07 20CCA	12/10/1974	C	P	10	637	P	1210	6715	664.75	T	04/12/1978
A-20-07 20DAD	04/28/1966	C	X	--	--	--	103	6820		D	04/28/1966
A-20-07 28BCC	06/ /1961	--	--	8	--	P	845	6785	791.00	S	03/30/1978
A-20-07 30BBB	08/ /1965	C	P	10	626	P	1075	6675	629.75	T	04/14/1978
A-20-07 30BDB	09/ /1969	C	P	12	--	P	1004	6685	632.20	T	10/08/1969
A-20-08 18BCC	12/ /1964	H	F	38	569	P	1091	6832	432.42	T	04/14/1965
A-20-08 18CAC	06/20/1976	C	P	6.62	555	P	675	6825	527.45	T	04/14/1978
A-20-08 19ABA	09/ /1972	H	F	20	800	P	1345	6809	334.90	T	02/20/1973
A-20-08 19DAC	07/26/1976	C	X	8	10	H	365	6795	273.00	T	04/14/1978

DISCHARGE (GALLONS PER MINUTE)	DATE DISCHARGE MEASURED	DRAW-DOWN (FEET)	TYPES OF LOGS AVAILABLE	PRINCIPAL AQUIFER	TEMPERATURE (DEGREES °C)	SPECIFIC CONDUCTANCE (UMHOS/CM AT 25° C)	LOCAL NUMBER	OTHER DATA AVAILABLE QW	WL
--	--	--	J,L,M	310SUPI	--	--	A-18-04 34ABB		
9	06/02/1967	--	--	330RDLL	--	829	A-18-05 27ABB	B	
92 R	--	--	--	330RDLL	--	--	A-18-05 27ABC		
--	--	--	D,J,T	330RDLL	--	--	A-18-05 28ADA		
9 R	05/31/1967	0	D	330RDLL	15.0	795	A-18-05 29ADC	B	
--	--	--	D	330RDLL	14.0	580	A-18-05 31BCD	B	
--	--	--	D	341MRTN	--	--	A-18-05 31DDB		
--	--	--	I	--	--	--	A-18-05 34BAC		
--	--	--	D	--	--	--	A-18-05 34BCA1		
--	--	--	D,I,J	--	--	--	A-18-05 34BCA2		
--	--	--	D	--	--	--	A-18-05 34BCA3		
40 R F	10/16/1973	50	D	310SUPI	--	--	A-18-06 04BBD		
--	--	--	--	310SUPI	--	--	A-18-06 04BCC		
--	--	--	--	310SUPI	--	--	A-18-06 17ACD		
--	--	--	--	310SUPI	--	--	A-18-06 21ACC		
--	--	--	--	--	--	--	A-18-06 21BBA		
--	--	--	--	310SUPI	--	--	A-18-06 21DBA1		
--	--	--	--	310SUPI	--	--	A-18-06 21DBA2		
--	--	--	--	310SUPI	--	--	A-18-06 21DBA3		
--	--	--	--	310SUPI	--	--	A-18-06 21DBA4		
--	--	--	--	310SUPI	--	--	A-18-06 21DBB		
--	--	--	D	310SUPI	--	--	A-18-06 21DCA		
35 B	05/27/1966	0	D	310SUPI	--	--	A-18-06 27CAC1		
21 B	07/13/1973	--	D	310SUPI	--	--	A-18-06 27CAC2		
--	--	--	--	--	--	--	A-18-06 27CBA1		
20 B	07/19/1973	38	D	310SUPI	--	--	A-18-06 27CBA2		
--	--	--	--	310SUPI	--	--	A-18-06 33ADD		
--	--	--	D	310SUPI	--	--	A-18-06 34BBA		
--	--	--	D	310CCNN	--	--	A-18-07 08DDC		
--	--	--	--	--	--	--	A-18-07 15CCB1		
100 R	--	48	--	111ALVM	--	--	A-18-07 15CCB2	I	A
450 R	07/22/1965	71	D	111ALVM	10.0	214	A-18-07 15CCB3	C	
94 R	1962	62	G	111ALVM	--	--	A-18-07 15CCC1	B	A
95 M	10/31/1977	8	D	310CCNN	13.0	240	A-18-07 15CCC2	I	T
50 R	12/ /1974	92	D	111ALVM	--	--	A-18-07 15CCC3	B	
75 R	06/04/1976	59	D	111ALVM	--	--	A-18-07 15CCC4		
--	--	--	--	111ALVM	--	--	A-18-07 16BCD1		
--	--	--	D	111ALVM	--	--	A-18-07 16BCD2		
--	--	--	--	111ALVM	--	--	A-18-07 16BDB		I
5 R	10/ /1969	60	D	111ALVM	--	--	A-18-07 16DAC1		T
--	--	--	D	--	--	--	A-18-07 16DAC2		
--	--	--	--	--	--	--	A-18-07 16DBB		
--	--	--	D	111ALVM	--	--	A-18-07 16DBC		
26 R	02/26/1972	--	D	111ALVM	--	--	A-18-07 16DDB		
--	--	--	D	--	--	--	A-18-07 22ABC		
55 R	01/ /1973	74	D	111ALVM	--	--	A-18-07 22BAA1		
188 R	08/ /1978	11	D	310CCNN	--	--	A-18-07 22BAA2		T
60 R	06/ /1965	--	D	111ALVM	--	--	A-18-07 22BAB		T
50 R	--	--	--	120VLCC	--	138	A-18-07 27CBA		
26 R	09/ /1965	58	D	310SUPI	16.5	197	A-18-07 27CBB	B	
--	--	--	D	--	--	--	A-18-09 06BBD		
29 R	--	--	D	120VLCC	--	--	A-18-09 28BCB		
12 R	--	--	D	--	--	--	A-18-09 28BDA		
5 R	01/20/1972	--	D	120VLCC	--	600	A-18-09 28CAD		
80 R	11/ /1970	5	D	120VLCC	--	800	A-18-09 28DBD	B	
--	--	--	--	111ALVM	--	--	A-18-09 28DDA1		
--	--	--	--	111ALVM	--	--	A-18-09 28DDA2		
--	--	--	--	120VLCC	12.5	520	A-18-09 29CAA	B	
5 E	08/21/1969	--	D	120VLCC	--	--	A-18-09 29CAC		
4	09/ /1972	--	D	111ALVM	--	--	A-18-09 29DAC		
--	--	--	D	111ALVM	--	--	A-18-09 29DDB		
--	--	--	--	341MRTN	--	350	A-19-01 33BBD	B	
51 M	--	0	D	310CCNN	--	--	A-19-06 14WBDC		T
--	--	--	D	--	--	--	A-19-06 17DAC		
100 R	07/15/1975	--	D	310SUPI	--	--	A-19-06 27ABB		
--	--	--	--	310SUPI	--	--	A-19-06 34DCB		
--	--	--	I,J	310CCNN	--	--	A-19-07 01DDD		T
--	--	--	--	--	--	--	A-19-07 20BBB		
--	--	--	D	120VLCC	--	--	A-19-07 20CBA		
--	--	--	--	120VLCC	--	--	A-20-04 04DCC1		
--	--	--	G	310CCNN	--	--	A-20-05 24BBD		
130	04/12/1978	--	D	310CCNN	--	--	A-20-07 20CCA		
--	--	--	--	--	--	--	A-20-07 20DAD		
150	03/30/1978	--	D	310CCNN	--	440	A-20-07 28BCC	I	
34 B	08/ /1965	20	D	310CCNN	11.5	440	A-20-07 30BBB	I	
55 V	10/09/1969	35	--	--	11.0	420	A-20-07 30BDB		
600 P	03/07/1975	431	D	310CCNN	--	578	A-20-08 18BCC	B	T
33 R	04/14/1978	--	D	310CCNN	11.0	400	A-20-08 18CAC	I	
701 M	04/03/1975	342	C,I,T,U,Z	310CCNN	10.5	270	A-20-08 19ABA	I	T
--	--	--	D	--	--	--	A-20-08 19DAC		

LOCAL NUMBER	DATE COMPLETED	METHOD CONST-RUCTED	FINISH	CASING DIAM-ETER (INCHES)	DEPTH TO FIRST OPENING (FEET)	USE OF WATER	DEPTH OF WELL (FEET)	ALTITUDE OF LAND SURFACE (FEET)	WATER LEVEL (FEET)		DATE WATER LEVEL MEASURED
A-20-08 20DBC	12/ /1975	C	P	20	650	P	1336	6817	275.00	T	12/ /1975
A-21-02 15BCC	1935	D	--	60	--	H	25	7240	9.00	F	09/22/1964
A-21-02 16ADD	1890	D	--	60	--	S,H	25	7250	9.00	F	09/22/1964
A-21-03 06ABA	1972	C	--	8	--	--	750	6950		D	--
A-21-03 26BBA	--	D	--	--	--	H,S	--	6726	0.00	S	06/18/1965
A-21-04 08DDB	--	--	--	--	--	S	--	6795	76.90	S	05/25/1978
A-21-04 33DCD	1970	H	P	--	--	--	40	6735	10.00	R	1970
A-21-04 33DDD	05/ /1968	P	F	6	--	H	41	6739	2.50	S	05/08/1973
B-17-01 25ABC	1940	--	--	6	--	U	111	4874	68.30	S	06/07/1977
B-18-01 06ABB	08/ /1937	--	--	--	--	S	460	4631	440.00	R	08/ /1937

DISCHARGE (GALLONS PER MINUTE)	DATE DISCHARGE MEASURED	DRAW-DOWN (FEET)	TYPES OF LOGS AVAILABLE	PRINCIPAL AQUIFER	TEMPERATURE (DEGREES °C)	SPECIFIC CONDUCTANCE (UMHOS/CM AT 25° C)	LOCAL NUMBER	OTHER DATA AVAILABLE QW	WL
1000 M	12/02/1975	182	C,E,J,T	310CCNN	--	--	A-20-08 20DBC		I
--	--	--	--	111ALVM	--	--	A-21-02 15BCC		
--	--	--	--	111ALVM	--	--	A-21-02 16ADD		
--	--	--	D	--	--	--	A-21-03 06ABA		
--	--	--	--	111ALVM	--	--	A-21-03 26BBA		
--	--	--	--	--	--	--	A-21-04 08DDB		
20 R	1970	--	--	120VLCC	--	--	A-21-04 33DCD		
20 R	05/29/1968	--	D	120VLCC	--	--	A-21-04 33DDD		I
3 R	1940	--	--	400GRCG	--	--	B-17-01 25ABC		
12 R	08/ /1937	--	D	341MRTN	18.0	650	B-18-01 06ABB	B	

Table 11.--Records of selected springs in the upper Verde River area

Local number: See figure 2 for description of well-numbering and location system; U, unsurveyed.
Use of water: C, commercial; E, power; H, domestic; I, irrigation; P, public supply; R, recreation; S, stock; T, institution; U, unused; Z, other.
Altitude of land surface: In feet above the National Geodetic Vertical Datum of 1929; determined from U.S. Geological Survey topographic maps.
Discharge: C, current meter; E, estimated; V, volumetric; W, weir; Z, other.

Principal aquifer: 111ALVM, alluvium; 120VLCC, volcanic rocks; 121VERD, Verde Formation; 310KIBB, Kaibab Limestone; 310TRWP, Toroweap Formation; 310CCNN, Coconino Sandstone; 310SUPI, Supai Formation; 310NACO, Naco Formation; 330RDLL, Redwall Limestone; 341MRTN, Martin Formation; 374TPTS, Tapeats Sandstone; 400GRCG, granitic gneiss; 400GRNT, granite.

QW data available: B, common ions; I, both common ions and trace elements.

LOCAL NUMBER	USE OF WATER	ALTITUDE OF LAND SURFACE (FEET)	DISCHARGE (GALLONS PER MINUTE)		DATE DISCHARGE MEASURED	PRINCIPAL AQUIFER	TEMPERATURE (DEGREES C)	SPECIFIC CONDUCTANCE (UMHOS/CM AT 25 C)	NAME OF SPRING	QW DATA AVAILABLE
A-11-06 10A U	U	2660	10	E	10/10/1951	120VLCC	39.0	4600	VERDE HUT	I
A-11-06 17C U	H,I	3870	220	E	04/21/1976	--	21.0	490	--	I
A-12-05 02C U	U	3100	--		--	120VLCC	7.5	420	DRIPPING	B
A-12-05 09D U	U	3480	--		--	--	16.0	600	--	
A-12-05 10A U	S	3590	--		--	120VLCC	11.0	900	TABLE MTN	I
A-12-05 24B U	H,S,I	3160	50	E	02/03/1959	341MRTN	21.0	690	BROWN	B
A-12-06 01B U	S	4200	--		--	120VLCC	16.0	540	CEDAR	B
A-12-06 11D U	H,S	4100	2	V	03/31/1977	111ALVM	11.0	430	HACKBERRY	B
A-12-07 14D U	E	4290	16620	C	07/10/1952	310NACO	--	--	FOSSIL	B
A-12-09 04B U	S	7120	--		--	310KIBB	--	--	WILDCAT	
A-13-04 23BBD	S	5100	2	E	07/10/1959	120VLCC	18.5	--	RYAL	
A-13-05 18CBB	S	3540	3	V	12/13/1977	120VLCC	16.5	675	COTTONWOOD	B
A-13-05 29CBB	U	3680	--		--	--	--	--	NORTH MINE	
A-13-05 29CCA	S	3700	2	E	12/21/1976	400GRNT	18.0	990	MINE	I
A-13-06 10AAD	S	4000	7	F	10/20/1959	120VLCC	19.0	--	BULL PEN	B
A-13-09 23ABB	S	6840	20	E	10/10/1952	310KIBB	8.0	--	CLOVER	
A-13-09 26CBB	H	7035	1	E	06/03/1953	310KIBB	10.0	--	FORTYFOUR	
A-13-09 28ABB	--	7000	--		--	310KIBB	9.0	--	PIVOT ROCK	
A-13-10 18BDB	H	7010	--		--	310KIBB	--	--	LONG VALLEY	
A-14-02H24ADD	P,S	5480	2	F	04/20/1978	400GRCG	13.0	440	POWELL	B
A-14-03 04AAA	S	4390	2	E	04/18/1978	400GRCG	14.5	660	GOAT CAMP	B
A-14-06 32CAA	S	3670	0.1	F	10/20/1959	120VLCC	--	--	HANCE	
A-14-08 32A U	S	5060	1000	E	05/28/1959	310CCNN	15.5	--	BUCKHORN	B
A-14-09 31DDC	Z	5930	100	E	05/27/1959	310CCNN	11.0	--	BEAR	B
A-15-02 01C U	--	5520	2	E	05/10/1978	400GRCG	14.5	6000	--	
A-15-02 02A1 U	P	5960	--		--	341MRTN	12.0	325	CLIFF	
A-15-02 02A2 U	P	5980	--		--	341MRTN	--	--	BALTIMORE	
A-15-02 02D U	P	6155	--		--	341MRTN	16.0	365	SILVER	I
A-15-02 11D1 U	P	6140	--		--	374TPTS	13.5	470	TWIN	
A-15-02 11D2 U	P	6200	--		--	341MRTN	12.0	160	COPPER CHIEF	
A-15-02 11D3 U	U	6160	40	E	05/10/1978	374TPTS	14.0	450	--	
A-15-02 13B U	P,S	6080	--		--	341MRTN	14.0	345	ALLEN	
A-15-03 29ACA	S	4170	1	E	11/13/1959	121VERD	15.0	--	QUAIL	B
A-15-04 04ACA	I	3340	5	E	06/09/1977	121VERD	19.0	700	COTTONTAIL	B
A-15-05 11AAB	S	3630	85	C	06/04/1974	310SUPI	25.0	400	BEAVERHEAD	B
A-15-06 23BDC	T	3980	--		--	310SUPI	21.5	330	--	
A-15-06 23BDD	T	3980	2	E	04/20/1978	310SUPI	21.5	330	--	
A-15-06 31DBA	I	3600	1050	C	06/19/1948	121VERD	21.0	925	MONTEZUMA WELL	I
A-15-06 32CBD	H,S,I	3595	15	E	02/06/1959	121VERD	24.0	--	SODA	B
A-15-06 35CAC	S,H	4120	75	F	07/10/1959	310CCNN	21.0	450	WALKER CR	B
A-15-07 14ACC	S	4990	1350	F	10/19/1959	310CCNN	15.5	--	WET BEAVER	B
A-16-02 14DAC	--	4275	2	E	05/04/1978	341MRTN	17.0	2300	HOGPEN	
A-16-02 28ADA	P	5780	52	V	05/10/1978	341MRTN	14.0	580	WALNUT	
A-16-03 21CBB	U	3375	60	F	10/29/1958	121VERD	--	--	GRAVEL PLANT	B
A-16-03 31DCA	P	3900	600	F	10/24/1958	330RDLL	18.0	--	HASKELL	I
A-16-04 14CCC	R	3520	300	F	07/10/1974	--	--	--	LOLO-MAI	
A-16-04 15CCC	S	3575	137	E	12/11/1951	--	20.0	--	SPRING CREEK	B
A-16-04 15DDD1	I	3575	60	C	02/12/1952	--	19.5	--	FREY RANCH	B
A-16-04 15DDD2	--	3590	10	E	07/10/1974	--	--	--	--	
A-16-04 23BBA	H,I	3510	160	C	12/10/1952	310SUPI	19.0	--	TURTLE POND	B
A-16-04 23BBB	Z	3525	264	C	07/09/1952	--	21.5	--	TREE ROUT	
A-16-04 23BBC	--	3525	3879	C	05/20/1968	310SUPI	19.5	--	BUBBLING POND	B
A-16-04 23DDC	H	3500	13913	C	08/04/1949	121VERD	20.0	--	PAGE	B
A-16-04 27CBD	--	3480	1	F	03/01/1974	--	16.5	575	HOLLY	
A-16-04 33BAB	I	3440	111	W	03/01/1974	--	18.5	500	SHEEPSHEAD CANYON	B
A-16-04 34BBB	I	3480	4	E	02/06/1959	--	--	--	HELLS CANYON	B
A-16-04 35ABC	--	3390	520	W	02/04/1959	--	--	--	LOWER NEWELL	
A-16-05 12ADD	S	4270	1	F	04/25/1974	310SUPI	12.5	675	BELL ROCK	
A-17-02 03AAA	U	3660	75	F	06/06/1977	310SUPI	18.5	350	--	B
A-17-03 05C U	U	3670	15	F	10/10/1951	330RDLL	19.0	--	--	B
A-17-03 05D U	U	3620	2700	Z	10/10/1951	330RDLL	19.5	--	SUMMERS	B
A-17-03 17DBC	U	3550	50	E	03/22/1977	310SUPI	20.0	525	--	
A-17-07 11ACC	H,S	6340	25	E	12/13/1960	--	11.0	200	WOODS	
A-18-01 18WBBD	S	4205	--		--	310SUPI	19.0	650	KING	
A-18-03 32A U	U	3760	1000	E	10/10/1951	330RDLL	25.0	--	PARSON	B
A-18-06 08ACD	P	5040	75	E	03/06/1974	--	--	350	BANJO BILL	B
A-18-06 27CCA	H	4560	115	E	02/14/1952	--	14.0	--	INDIAN GARDENS	
A-18-06 27CCD	I	4580	177	C	02/14/1952	--	14.0	--	THOMPSON PASTURE	
A-18-08 13DAB	R	7185	--		--	120VLCC	8.0	85	DOUBLE	
A-18-09 07CAD	P	7135	--		--	120VLCC	9.5	85	DAIRY	
A-19-04 02CAA	S	6180	1	E	08/11/1949	120VLCC	--	--	DORSEY	
A-19-04 36ACC	S	6360	10	E	09/20/1962	310KIBB	--	--	BUNKER HILL	
A-19-05 09AAD	S,H	6895	5	E	09/20/1962	120VLCC	10.0	--	LOCKWOOD	
A-19-05 24CCC	S	6750	2	E	09/20/1962	310KIBB	--	--	BUZZARD	
A-19-05 25DDA	S	6740	0.1	V	08/25/1949	310TRWP	8.5	--	BARNEY	
A-19-06 15DDD1	C	5760	291		08/13/1949	310CCNN	11.0	--	STERLING	B
A-19-06 15DDD2	U	5760	21		08/13/1949	310CCNN	11.0	--	STERLING	B
A-19-06 15DDD3	U	5760	20	E	08/13/1949	310CCNN	11.0	--	STERLING	
A-19-06 27EBCC	--	5465	1	E	08/17/1949	310SUPI	12.0	--	GRASSY MEADOW	B
A-19-06 27WD U	R	5440	--		--	--	11.5	475	CAVE	B

LOCAL NUMBER	USE OF WATER	ALTITUDE OF LAND SURFACE (FEET)	DISCHARGE (GALLONS PER MINUTE)	DATE DISCHARGE MEASURED	PRINCIPAL AQUIFER	TEMPERATURE (DEGREES °C)	SPECIFIC CONDUCTANCE (UMHOS/CM AT 25° C)	NAME OF SPRING	QW DATA AVAILABLE
A-19-06 34WA U	I	5480	25 E	08/17/1949	310SUPI	13.0	--	LOLAMI	
A-19-06 34WC1 U	H	5300	50 E	08/18/1949	310SUPI	13.0	--	SHERWOOD	
A-19-06 34WC2 U	H	5300	25 E	08/18/1949	310SUPI	13.0	--	HUMMINGBIRD	
A-20-04 03BCD	H	6740	--	--	120VLCC	10.5	--	LOWER HULL	
A-20-04 03CDD	S	6705	--	--	120VLCC	--	--	RAILROAD	
A-20-04 09ABB	S	6655	20 E	08/31/1949	120VLCC	10.5	--	POISON	
A-20-04 10CAB	U	6695	10 E	09/20/1962	120VLCC	15.5	--	GRAY	
A-20-04 35AAB	S	6325	--	--	120VLCC	--	--	KELSEY	
A-20-04 35ABD	S	5915	0.5 E	07/29/1949	310KIBB	9.5	--	BARES HOLE	
A-20-06 13CCC	P	6895	10 V	07/08/1952	120VLCC	9.0	--	LINDBERGH	
A-20-08 34CDB	S	6895	4 E	07/16/1959	310KIBB	--	--	BABBIT	
A-21-02 30CAC	S	6985	2 E	09/30/1976	120VLCC	11.0	170	WEST TWIN	B
A-21-02 30DAB	S	7060	0.1 E	09/30/1976	120VLCC	15.0	140	EAST TWIN	B
A-21-03 23ABC	S	6840	0.5 E	08/18/1965	120VLCC	--	--	BUCK	
A-21-03 27BAD	S	6720	0.7 E	08/18/1965	111ALVM	--	--	ROSILDA	
A-21-04 20BCA	S	6720	0.5 E	08/18/1965	120VLCC	--	--	GARLAND	
A-21-04 32DAD	--	6690	1 E	08/31/1949	120VLCC	11.0	--	L O	

Table 12.--Measurements of water level in selected wells in the upper Verde River area

Local number: See figure 2 for description of well-numbering and location system.
Water level: Site status: F, flowing; P, pumping; R, recently pumped; S, nearby pumping.

Method of measurement: E, estimated; L, geophysical logs; R, reported; S, steel tape; T, electric tape; Z, other.

LOCAL NUMBER	DATE MEASURED	WATER LEVEL, IN FEET BELOW LAND SURFACE		METHOD OF MEASUREMENT
A-13-05 05BDC	07/15/1959	54.10	R	S
	08/20/1959	54.05		S
	09/17/1959	54.70		S
	10/16/1959	54.48		S
	11/13/1959	55.11		S
	12/16/1959	55.09		S
	04/22/1960	54.70		S
	06/02/1960	54.62		S
	06/24/1960	54.75		S
	07/21/1960	54.96		S
	06/15/1961	55.20		S
	04/19/1962	56.93		S
	04/04/1963	56.98		S
	01/03/1964	55.34		S
	01/19/1965	54.79	R	S
	02/18/1966	54.41		S
	02/08/1967	54.99		S
	02/07/1968	54.07		S
	12/01/1976	58.15	R	S
	08/01/1977	55.70	R	T
	08/11/1977	55.25		T
	01/18/1978	56.50		T
	02/28/1979	55.40		S
A-13-05 05DBB	01/19/1965	45.65		S
	02/08/1967	45.79		
A-13-05 06AAA	01/06/1977	23.26	R	S
	04/11/1977	23.80	R	S
A-13-05 13DBC	12/08/1976	95.74		S
	08/01/1977	95.85		S
A-13-05 15AAA	04/08/1959	42.60		S
	12/07/1976	40.95		S
	08/01/1977	41.20		T
	01/18/1978	41.00		T
	02/28/1979	41.00		S
A-13-05 17ABB3	01/19/1965	41.50		S
	02/08/1966	41.55		
A-13-10 06ADA	07/13/1966	468.20		S
	03/14/1968	468.50		
	05/06/1968	468.10		
	04/14/1969	467.10		
	03/17/1970	467.80		
	04/06/1971	467.40		
	02/10/1972	472.00		T
A-14-04 02CCD	03/30/1977	22.95		S
	08/01/1977	23.50		T
A-14-04 13DAB3	03/29/1977	104.20		S
	08/01/1977	104.80		S
A-14-05 02BAD	08/01/1970	35.00		R
	06/01/1972	53.00		R
	12/01/1972	54.00		R
	06/01/1973	50.00		E
	12/01/1973	54.00		R
	06/01/1974	53.00		R
	12/01/1974	64.00		R
	06/01/1975	64.00		R
A-14-05 17AAC	11/25/1958	63.00		S
	06/12/1959	64.97		S
	07/15/1959	65.15		S
	08/19/1959	65.21		S
	01/21/1960	64.35		S
	06/15/1961	61.85		S
	04/19/1962	53.02		S
	04/04/1963	60.10		S
	01/02/1964	70.26		S
	01/19/1965	65.36		S
	02/07/1966	38.63		S
	02/08/1967	42.61		S
	02/07/1968	39.20		S
	02/26/1969	35.50		S
	02/16/1970	48.30		S
	01/18/1971	42.10		S
	03/07/1972	39.40		S
	04/05/1973	35.20		S
	02/07/1974	44.50		S
	03/10/1975	37.30		S
	01/22/1976	39.60		S
	01/25/1977	43.20		S
	01/18/1978	41.25		T
	02/28/1979	30.70		S
A-14-05 32BBB1	01/06/1977	22.71		S
	05/10/1977	22.10		S
	06/01/1977	21.85		Z
	06/21/1977	22.03		Z
	07/01/1977	21.80		Z
	08/01/1977	21.54		Z
	09/01/1977	21.96		Z
	10/01/1977	21.87		Z
	11/01/1977	22.31		Z
	12/01/1977	22.38		Z
	01/01/1978	22.68		Z
	01/18/1978	22.87		Z
A-14-05 32BBB1 CONTINUED	02/01/1978	23.09		Z
	03/01/1978	23.09		Z
	04/01/1978	22.53		Z
	05/01/1978	22.40		Z
	06/01/1978	21.86		Z
	07/01/1978	22.14		Z
	08/01/1978	21.96		Z
	09/01/1978	22.42		Z
	10/01/1978	22.22		Z
	11/01/1978	22.08		Z
	02/28/1979	23.66		S
	05/09/1979	20.62		Z
	06/01/1979	19.55		Z
	07/01/1979	19.33		Z
	08/01/1979	19.48		Z
	09/01/1979	19.50		Z
	10/01/1979	19.34		Z
	11/01/1979	20.00		Z
	01/14/1980	22.18		S
	02/01/1980	22.63		Z
	03/01/1980	21.84		Z
	03/18/1980	22.01		S
	04/01/1980	22.46		Z
	05/01/1980	19.92		Z
	06/01/1980	20.18		Z
	08/26/1980	19.73		S
A-14-05 32CBB2	04/01/1959	69.00		R
	04/30/1959	73.01	P	S
	03/16/1977	70.65		S
	04/11/1977	75.30	R	S
A-14-10 04ABD	07/20/1966	7.60		S
	09/20/1978	9.90		S
A-14-10 32DBD	06/09/1966	343.80		S
	05/01/1969	344.35		S
	03/17/1970	343.20		S
	04/06/1971	343.30		S
	02/10/1972	348.40		T
	02/12/1974	345.50		T
	01/20/1976	315.50		S
	01/31/1977	348.60		S
	02/23/1978	339.90		T
	02/28/1979	335.00		T
A-15-03 12ADB1	10/14/1958	17.98		S
	06/11/1959	18.48		S
	07/14/1959	17.52		S
	08/18/1959	16.50		S
	09/17/1959	16.54		S
	10/15/1959	16.18		S
	11/10/1959	15.95		S
	06/15/1961	18.09		S
	04/19/1962	16.50		S
	04/05/1963	16.97		S
	07/16/1963	19.12		S
	01/03/1964	16.44		S
	01/20/1965	16.95		S
	02/09/1966	16.82		S
	02/09/1967	19.10		S
	08/16/1977	30.90		T
	01/18/1978	24.85		T
	02/28/1979	23.80		S
A-15-03 12ADB2	10/14/1958	23.60		S
	04/23/1959	23.51		S
	06/11/1959	23.37		S
	07/15/1959	23.01		S
	08/18/1959	23.20		S
	09/17/1959	23.43		S
	10/15/1959	23.43		S
	11/13/1959	23.49		S
	04/19/1962	24.75		S
	04/05/1963	23.82		S
	07/16/1963	25.72		S
	01/03/1964	25.27		S
	01/20/1965	24.58		S
	02/09/1966	24.35		S
	02/09/1967	20.75		S
	08/16/1977	30.65		T
A-15-04 02CCB2	06/11/1959	72.23		S
	08/21/1959	75.04	R	
	10/15/1959	70.94		
	01/21/1960	71.00		
	03/02/1960	71.19		
	04/21/1960	71.68		
	06/02/1960	72.35		
	06/23/1960	71.90		
	06/15/1961	70.34		
	04/19/1962	72.94		
	04/05/1963	74.67		
	07/16/1963	74.65		
	01/03/1964	73.28		
	01/20/1965	71.21		
	02/07/1966	72.45		
	02/10/1967	72.67		
A-15-04 02CCB4	07/26/1977	103.65	R	T
	01/24/1978	81.90		T
	02/28/1979	90.70		T

LOCAL NUMBER	DATE MEASURED	WATER LEVEL, IN FEET BELOW LAND SURFACE	METHOD OF MEASUREMENT
A-15-04 02CCC2	04/30/1959	93.50	S
	06/11/1959	92.80	
	07/15/1959	96.25 R	
	08/20/1959	92.65	
	09/18/1959	93.68 R	
	06/28/1977	97.05 R	
A-15-04 04DDC1	08/18/1959	36.85	S
	09/18/1959	37.22	
	10/15/1959	36.76	
	12/18/1959	36.90	
	01/21/1960	37.47	
	03/02/1960	37.90	
	06/02/1960	37.15	
	06/23/1960	37.09	
	07/21/1960	37.30	
	09/21/1960	37.64	
	06/15/1961	38.88	
	04/19/1962	41.84	
	04/05/1963	41.08	
	01/03/1964	42.20	
	01/20/1965	53.08	
	02/07/1966	44.05	
	02/10/1967	44.12	
	03/07/1968	43.69	
	11/23/1969	44.06	S
	02/16/1970	44.30	S
	01/18/1971	42.80	S
	03/07/1972	48.10	S
	04/05/1973	46.70	S
	02/07/1974	47.40	
	03/10/1975	46.60	
	01/22/1976	56.40	
	01/25/1977	60.40	S
	06/07/1977	60.05	S
	01/18/1978	59.60	T
	02/28/1979	56.05	S
A-15-04 09ADD	01/01/1976	F	
	07/12/1977	5.20	S
A-15-04 12ABB	11/13/1974	206.79	T
	07/21/1977	200.50	T
A-15-04 15DAC	07/01/1972	F	T
	07/27/1977	11.65 R	T
	08/16/1977	-1.05	T
A-15-06 21DDC	07/16/1974	26.00	R
	02/01/1978	25.50	S
A-16-03 22DCD	10/15/1958	15.50	S
	04/23/1959	22.05	S
	06/11/1959	22.45	S
	07/13/1959	22.45	S
	08/18/1959	21.80	S
	09/17/1959	22.01	S
	10/15/1959	21.43	S
	12/17/1959	20.38	S
	01/22/1960	20.30	S
	03/02/1960	20.15	S
	04/21/1960	20.66	S
	06/02/1960	21.43	S
	06/23/1960	21.66	S
	04/19/1962	23.12	S
A-16-03 27BAD	10/15/1958	F	
	02/09/1978	-.10	S
A-16-03 30ABD	05/01/1957	360.00	R
	02/08/1978	351.30	T
A-16-03 31DCA	01/01/1961	11.50	R
	10/27/1977	27.00	S
A-16-03 34CCD1	03/23/1959	138.60	S
	01/03/1964	146.90	S
	01/20/1965	137.80	S
	02/07/1966	144.00	Z
	02/09/1967	144.10	Z
A-16-03 34CCD2	04/21/1972	165.00	R
	04/01/1977	174.00	S
A-16-03 34CDC	01/03/1964	215.60	S
	04/01/1977	224.00	S
A-16-03 35DAB2	01/01/1975	F	
	09/01/1977	16.90	T
A-16-03 35DCD	01/01/1950	F	
	01/01/1968	20.00	R
	09/01/1977	23.50	T
A-16-03 35DDC	10/07/1958	25.00	R
	09/07/1977	26.40	T
A-16-03 36DAC	03/07/1975	57.00	S
	09/07/1977	60.10	T
A-16-04 20BBB	02/27/1975	173.00	L
	09/08/1977	174.60	T
A-16-05 14DAD	08/06/1974	382.20	S
	09/01/1974	383.35	S
	10/01/1974	383.98	S
	11/01/1974	383.70	S
	12/01/1974	383.52	S
	01/01/1975	382.82	S
	02/01/1975	382.92	S
	03/01/1975	382.87	S
	04/01/1975	382.88	S
	05/01/1975	382.32	S
	06/01/1975	382.26	S
	07/01/1975	383.03	S
	08/01/1975	383.68	S
	09/01/1975	384.71	S
	10/01/1975	385.07	S
	11/01/1975	385.50	S
	12/01/1975	385.39	S
	01/09/1976	384.62	S
	01/25/1977	368.30	T
	08/11/1977	387.80	T
	09/07/1977	388.20	S
	02/01/1978	386.60	S
	03/01/1979	384.50	S
A-16-06 17CBB1	04/26/1974	417.40	T
	06/11/1974	417.80	T
	08/02/1974	419.10	T
	10/04/1974	416.90	T
	08/01/1977	421.45	T
	01/31/1978	419.70	T
	03/01/1979	418.35	T
A-17-05 11DCC2	05/21/1957	125.30	
	03/04/1960	126.65	
	06/16/1961	127.20	
	04/19/1962	134.45	
	01/03/1964	125.50	
	01/20/1965	125.30	
	02/08/1974	129.40	T
A-17-05 15ABD	10/24/1973	500.09	T
	12/01/1973	501.72	S
	01/01/1974	502.01	S
	02/01/1974	501.00	S
	03/01/1974	499.80	S
	04/01/1974	498.10	S
	05/01/1974	497.88	S
	06/01/1974	499.98	S
	07/01/1974	502.48	S
	08/01/1974	503.22	S
	09/01/1974	502.89	S
	10/01/1974	502.78	S
	11/01/1974	501.03	S
	12/01/1974	498.48	S
	01/01/1975	497.39	S
	02/01/1975	496.07	S
	02/27/1975	494.54	S
	03/01/1975	494.35	S
	04/01/1975	488.73	S
	05/01/1975	484.45	S
	06/01/1975	487.88	S
	07/01/1975	496.84	S
	08/01/1975	498.22	S
	10/01/1975	498.69	S
	11/01/1975	498.48	S
	12/01/1975	498.48	S
	01/22/1976	496.40	
	01/25/1977	481.30	T
	08/02/1977	499.65	T
	01/31/1978	502.20	T
	02/28/1979	501.65	T
A-17-05 25AAA	01/13/1967	596.20	T
	07/11/1972	598.20	T
A-17-05 25BBD	01/16/1967	209.60	S
	03/14/1974	208.60	
A-17-05 26CAA2	01/06/1967	19.50	S
	05/08/1972	23.80	
	04/05/1973	12.20	
	02/05/1974	20.03	S
	04/16/1974	21.21	Z
	04/26/1974	19.82	Z
	05/31/1974	20.34	Z
	06/11/1974	18.54	Z
	06/19/1974	18.57	Z
	06/24/1974	19.27	Z
	08/06/1974	19.21	Z
	01/17/1975	20.04	S
A-17-05 29BAD	05/22/1960	400.00	R
	12/15/1960	395.00	T
	05/08/1972	396.60	T
A-17-05 34AAA	12/16/1960	168.20	S
	04/17/1974	166.40	S

Table 12.--Measurements of water level in selected wells in the upper Verde River area--Continued

LOCAL NUMBER	DATE MEASURED	WATER LEVEL, IN FEET BELOW LAND SURFACE	METHOD OF MEASUREMENT
A-17-06 19BAC	05/23/1957	40.23	S
	01/03/1967	47.10	
	10/11/1974	43.65	S
A-17-06 30ABC	01/13/1967	482.70	T
	07/11/1972	485.95	T
	03/06/1974	459.80	
	02/25/1975	450.80	L
A-17-06 30BBB	12/14/1960	437.50	T
	04/19/1962	454.42	T
	01/03/1964	439.70	T
	02/09/1966	439.40	S
	02/09/1967	439.80	T
	02/07/1968	439.70	T
	02/26/1969	439.60	T
	02/16/1970	440.80	T
	01/18/1971	440.80	T
	04/05/1973	441.40	T
	02/07/1974	440.90	T
	02/11/1975	441.80	S
	01/22/1976	441.50	
	01/25/1977	436.00	T
	08/01/1977	444.80	T
	01/31/1978	445.10	T
	03/01/1979	444.32	T
A-18-07 15CCB2	07/22/1965	101.04	S
	04/07/1967	113.75	S
	06/02/1967	125.40	S
	09/19/1967	133.86	S
	11/02/1967	138.80	S
	02/09/1968	115.61	S
	08/27/1968	136.25	S
	09/30/1968	136.70 S	S
	04/09/1969	119.35	S
	03/17/1970	133.50	S
	04/09/1971	151.13 S	S
	04/09/1973	82.93 S	S
	03/24/1975	112.37	S
	01/22/1976	157.60	S
	01/25/1977	138.10	S
	10/31/1977	119.70	S
	01/18/1978	142.80	T
	03/01/1979	138.88	T
A-18-07 15CCC1	01/11/1967	117.90	S
	01/22/1976	168.00	S
	11/02/1977	163.75	S
	01/18/1978	161.10	T
	03/01/1979	155.07	T
A-18-07 15CCC2	07/02/1977	705.00	R
	09/01/1977	711.30	T
A-18-07 16BDB	01/11/1967	8.25	S
	01/30/1978	16.50	S
A-18-07 16DAC1	10/24/1969	140.00	R
	01/30/1978	161.00	T
A-18-07 22BAA2	10/31/1977	713.00	T
	04/13/1978	712.60	T
	01/09/1980	714.60	T
A-18-07 22BAB	01/11/1967	108.40	S
	04/13/1978	115.00	T
A-19-06 14WBDC	10/27/1978	830.00	T
	05/20/1980	826.85	T
A-19-07 01DDD	08/23/1976	420.00	T
	03/10/1977	424.40	T
A-20-08 18BCC	04/14/1965	432.42	T
	04/05/1971	448.20	T
	02/20/1973	480.40	T
	03/06/1974	463.15	T
	03/01/1975	474.00	
	07/25/1977	483.00	T
	01/18/1978	832.40 P	T
A-20-08 19ABA	02/20/1973	334.90	T
	03/01/1975	329.00	T
	01/18/1978	650.10 P	T
A-20-08 20DBC	12/01/1975	275.00	T
	03/01/1975	288.60	T
	07/21/1977	289.60	T
A-21-04 33DDD	05/29/1968	8.50	R
	05/08/1973	2.50	S

Local number: See figure 2 for description of location system; UNSURV, unsurveyed.
Site: SP, spring; GW, ground water.
Geologic units: 111ALVM, alluvium; 120VLCC, volcanic rocks; 121VERD, Verde Formation; 310CCNN, Coconino Sandstone; 310SUPI, Supai Formation; 310NACO, Naco Formation; 330RDLL, Redwall Limestone; 341MRTN, Martin Formation; 400GRNT, granite; 400GRCG, granitic gneiss.

Code for agency analyzing sample: 1028, U.S. Geological Survey analysis, laboratory unidentified; 80020, U.S. Geological Survey analysis, Denver laboratory; 9704, Arizona Department of Health Services; 9802, Salt River Valley Users' Association; 9801, Private laboratories, Arizona Testing Laboratory and Engineers Testing Laboratories, Inc.
Specific conductance: Values are in micromhos per centimeter at 25° Celsius.

LOCAL IDENT-I-FIER		SITE	GEO-LOGIC UNIT	DATE OF SAMPLE	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG °C)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)
A-11-06 10A	UNSURV	SP	120VLCC	51-12-10	1028	4660	--	--	474	0	116
		SP	120VLCC	77-12-14	1028	4600	6.5	39.0	450	0	110
		SP	120VLCC	77-12-14	1028	4600	6.5	39.5	450	0	110
		SP	120VLCC	79-06-12	80020	--	--	--	460	0	110
A-11-06 17C	UNSURV	SP	--	76-04-21	1028	490	7.6	21.0	260	11	59
A-12-05 02C	UNSURV	SP	120VLCC	77-12-13	1028	420	8.1	7.5	240	35	50
A-12-05 10A	UNSURV	SP	120VLCC	77-12-13	1028	900	7.3	11.0	500	67	92
A-12-05 24B	UNSURV	SP	341MRTN	59-02-03	1028	678	8.0	21.5	316	0	58
		SP	341MRTN	77-12-13	1028	690	7.4	21.0	320	0	61
A-12-06 01B	UNSURV	SP	120VLCC	77-12-14	1028	540	7.2	18.0	260	0	61
A-12-06 11D	UNSURV	SP	111ALVM	77-12-14	1028	420	7.5	4.0	180	2	50
A-12-07 14D	UNSURV	SP	310NACO	52-02-15	1028	758	--	--	--	--	--
		SP	310NACO	52-02-16	1028	753	--	21.5	424	26	104
		SP	310NACO	52-07-10	1028	750	--	24.0	--	--	--
		SP	310NACO	54-10-07	1028	760	--	21.5	--	--	--
		SP	310NACO	55-06-30	1028	756	6.7	21.0	--	--	--
		SP	310NACO	56-06-22	1028	762	7.4	21.5	428	33	--
		SP	310NACO	57-05-29	1028	765	7.4	21.5	416	21	--
		SP	310NACO	58-07-22	1028	747	7.2	21.5	400	12	--
		SP	310NACO	59-07-15	1028	745	7.3	21.0	410	16	106
		SP	310NACO	78-05-24	1028	700	6.7	22.0	410	12	98
A-13-04 12AAA		GW	121VERD	79-05-03	80020	4500	--	--	--	--	--
A-13-04 12ADD		GW	121VERD	76-12-23	1028	2375	7.0	20.0	1500	1100	150
A-13-05 05BAD2		GW	121VERD	76-12-01	1028	950	7.5	13.0	370	14	74
A-13-05 05BDC		GW	121VERD	76-07-28	9704	--	--	--	--	--	--
		GW	121VERD	79-05-31	80020	1100	--	--	--	--	--
A-13-05 05DAB1		GW	121VERD	77-11-21	1028	1250	7.4	--	--	--	--
A-13-05 05DAC2		GW	121VERD	79-05-31	80020	1490	--	--	--	--	--
A-13-05 05DBA		GW	121VERD	75-06-21	9704	568	8.0	--	118	--	28
A-13-05 06AAA		GW	121VERD	77-01-06	1028	850	7.2	18.0	410	9	75
A-13-05 06BBD1		GW	121VERD	76-12-23	1028	1950	7.0	24.0	530	270	75
A-13-05 06CBC2		GW	111ALVM	77-04-12	1028	5600	7.6	20.0	730	270	63
A-13-05 06DAA1		GW	121VERD	76-12-02	1028	1900	7.5	--	520	170	98
A-13-05 07BDA		GW	111ALVM	75-07-18	9704	1110	--	--	500	--	62
		GW	111ALVM	75-11-19	9704	1260	8.0	--	440	--	64
		GW	111ALVM	76-12-09	1028	1200	7.7	18.0	430	0	56
A-13-05 08BDA1		GW	121VERD	76-12-02	1028	1600	7.4	--	500	90	95
A-13-05 12CCA		GW	121VERD	77-11-21	1028	1250	7.7	--	830	570	150
A-13-05 13DBC		GW	121VERD	79-05-03	80020	435	7.4	18.5	--	--	--
A-13-05 15AAA		GW	121VERD	59-03-25	1028	--	7.7	--	18200	18000	518

Table 13.--Chemical analysis of water from selected wells and springs in the upper Verde River area—Continued

LOCAL IDENT- I- FIER	DATE OF SAMPLE	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM+ POTAS- SIUM DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)
A-11-06 10A UNSURV	51-12-10	45	--	--	996	--	1560	--	566	545
	77-12-14	42	1000	21	--	39	1520	0	590	570
	77-12-14	42	930	19	--	36	1510	0	580	560
	79-06-12	46	1000	20	1000	40	--	--	650	540
A-11-06 17C UNSURV	76-04-21	28	9.6	.3	--	1.4	307	0	8.6	6.4
A-12-05 02C UNSURV	77-12-13	28	19	.5	--	3.2	250	0	24	7.6
A-12-05 10A UNSURV	77-12-13	66	30	.6	--	1.6	530	0	90	13
A-12-05 24B UNSURV	59-02-03	42	--	.9	36	--	414	0	29	16
	77-12-13	40	38	.9	--	2.4	400	0	37	22
A-12-06 01B UNSURV	77-12-14	27	25	.7	--	2.1	330	0	11	16
A-12-06 11D UNSURV	77-12-14	14	20	.6	--	3.3	220	0	18	14
A-12-07 14D UNSURV	52-02-15	--	--	--	--	--	488	--	--	8.0
	52-02-16	40	--	--	6.9	--	485	--	27	9.0
	52-07-10	--	--	--	--	--	490	--	--	9.0
	54-10-07	--	--	--	--	--	489	--	--	10
	55-06-30	--	--	--	--	--	475	0	--	8.0
	56-06-22	--	--	--	--	--	482	0	--	9.5
	57-05-29	--	--	--	--	--	482	0	--	10
	58-07-22	--	--	--	--	--	474	0	--	10
	59-07-15	35	--	.2	9.9	--	460	0	23	9.0
	78-05-24	39	12	.3	--	1.8	480	0	27	8.3
A-13-04 12AAA	79-05-03	--	--	--	--	--	--	--	--	--
A-13-04 12ADD	76-12-23	280	81	.9	--	28	538	0	1200	37
A-13-05 05BAD2	76-12-01	46	67	1.5	--	4.4	440	0	130	34
A-13-05 05BDC	76-07-28	--	--	--	--	--	--	--	--	--
	79-05-31	--	--	--	--	--	--	--	--	--
A-13-05 05DAB1	77-11-21	--	--	--	--	--	--	0	--	--
A-13-05 05DAC2	79-05-31	--	--	--	--	--	--	--	--	--
A-13-05 05DBA	75-08-21	12	68	3.5	--	--	--	0	69	40
A-13-05 06AAA	77-01-06	54	40	.9	--	2.4	488	0	78	24
A-13-05 06BBD1	76-12-23	84	300	5.7	--	13	316	0	620	200
A-13-05 06CBC2	77-04-12	140	980	16	--	11	570	0	1900	360
A-13-05 06DAA1	76-12-02	67	230	4.4	--	11	430	0	480	130
A-13-05 07BDA	75-07-18	83	150	2.9	--	--	--	--	220	70
	75-11-19	65	130	2.7	--	--	--	0	190	66
	76-12-09	70	120	2.5	--	3.8	559	0	190	46
A-13-05 08BDA1	76-12-02	64	160	3.5	--	10	501	0	350	88
A-13-05 12CCA	77-11-21	110	9.4	.1	--	5.1	320	0	540	5.0
A-13-05 13DBC	79-05-03	--	--	--	--	--	--	0	--	--
A-13-05 15AAA	59-03-25	4450	--	72	24300	--	226	0	64700	3530

LOCAL IDENT-I-FIER		DATE OF SAMPLE	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
A-11-06 10A	UNSURV	51-12-10	1.5	60	--	3100	--	--	--	--	--
		77-12-14	1.5	69	--	3160	4.32	--	.00	.02	.06
		77-12-14	1.4	69	--	3080	4.19	--	.00	.01	.03
		79-06-12	1.5	62	--	3230	4.39	--	--	--	--
A-11-06 17C	UNSURV	76-04-21	.2	44	--	310	.42	--	.35	.07	.21
A-12-05 02C	UNSURV	77-12-13	.2	75	--	336	.46	--	1.2	.00	.00
A-12-05 10A	UNSURV	77-12-13	.2	46	--	600	.82	--	.00	.00	.00
A-12-05 24B	UNSURV	59-02-03	.2	54	--	441	.60	.32	--	--	--
		77-12-13	.4	48	--	448	.61	--	.41	.02	.06
A-12-06 01B	UNSURV	77-12-14	.2	54	--	360	.49	--	.15	.00	.00
A-12-06 11D	UNSURV	77-12-14	.3	62	--	311	.42	--	.00	.10	.31
A-12-07 14D	UNSURV	52-02-15	--	--	--	--	--	--	--	--	--
		52-02-16	.1	14	--	440	.60	--	--	--	--
		52-07-10	--	--	--	--	--	--	--	--	--
		54-10-07	--	--	--	--	--	--	--	--	--
		55-06-30	--	--	--	--	--	--	--	--	--
		56-06-22	--	--	--	--	--	--	--	--	--
		57-05-29	--	--	--	--	--	--	--	--	--
		58-07-22	--	--	--	--	--	--	--	--	--
		59-07-15	.3	17	--	437	.59	--	--	--	--
		78-05-24	.1	13	--	437	.59	--	.14	.01	.03
A-13-04 12AAA		79-05-03	--	--	--	--	--	--	--	--	--
A-13-04 12ADD		76-12-23	1.0	33	--	2080	2.83	--	1.4	.07	.21
A-13-05 05BAD2		76-12-01	.5	35	--	612	.83	--	.91	.04	.12
A-13-05 05BDC		76-07-28	--	--	--	--	--	--	--	--	--
		79-05-31	--	--	--	--	--	--	--	--	--
A-13-05 05DAB1		77-11-21	--	--	--	--	--	--	--	--	--
A-13-05 05DAC2		79-05-31	--	--	--	--	--	--	--	--	--
A-13-05 05DBA		75-08-21	.7	--	404	--	--	2.9	--	--	--
A-13-05 06AAA		77-01-06	.4	38	--	559	.76	1.3	1.3	.07	.21
A-13-05 06BBD1		76-12-23	2.9	97	--	1550	2.11	--	.23	.13	.40
A-13-05 06CBC2		77-04-12	.7	53	--	3790	5.15	--	.44	.10	.31
A-13-05 06DAA1		76-12-02	2.9	75	--	1310	1.78	--	.01	.00	.00
A-13-05 07BDA		75-07-18	.7	--	871	--	--	--	--	--	--
		75-11-19	.7	--	871	--	--	--	--	--	--
		76-12-09	.7	35	--	806	1.10	1.9	1.9	.07	.21
A-13-05 08BDA1		76-12-02	2.4	70	--	1110	1.51	--	.11	.00	.00
A-13-05 12CCA		77-11-21	.5	37	--	1020	1.39	--	.34	.01	.03
A-13-05 13DBC		79-05-03	--	--	--	--	--	--	--	--	--
A-13-05 15AAA		59-03-25	--	15	--	97700	132	--	--	--	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
A-11-06 10A UNSURV	51-12-10	--	--	--	--	--	--	--	--	--
	77-12-14	--	--	9100	--	--	--	--	870	--
	77-12-14	--	--	9100	--	--	--	--	790	--
	79-06-12	--	1400	320	--	--	--	--	700	--
A-11-06 17C UNSURV	76-04-21	--	--	20	--	--	--	--	0	--
A-12-05 02C UNSURV	77-12-13	--	--	30	--	--	--	--	50	--
A-12-05 10A UNSURV	77-12-13	--	--	40	--	--	--	--	40	--
A-12-05 24B UNSURV	59-02-03	--	--	--	--	--	--	--	--	--
	77-12-13	--	--	130	--	--	--	--	30	--
A-12-06 01B UNSURV	77-12-14	--	--	20	--	--	--	--	40	--
A-12-06 11D UNSURV	77-12-14	--	--	20	--	--	--	--	40	--
A-12-07 14D UNSURV	52-02-15	--	--	--	--	--	--	--	--	--
	52-02-16	--	--	--	--	--	--	--	--	--
	52-07-10	--	--	--	--	--	--	--	--	--
	54-10-07	--	--	--	--	--	--	--	--	--
	55-06-30	--	--	--	--	--	--	--	--	--
	56-06-22	--	--	--	--	--	--	--	--	--
	57-05-29	--	--	--	--	--	--	--	--	--
	58-07-22	--	--	--	--	--	--	--	--	--
	59-07-15	--	--	--	--	--	--	--	--	--
	78-05-24	--	--	60	--	--	--	--	20	--
A-13-04 12AAA	79-05-03	12	--	--	--	--	--	--	--	--
A-13-04 12ADD	76-12-23	--	17	1700	--	--	--	--	20	--
A-13-05 05BAD2	76-12-01	--	28	280	--	--	--	--	10	--
A-13-05 05BDC	76-07-28	50	--	--	--	--	--	--	--	--
	79-05-31	43	--	--	--	--	--	--	--	--
A-13-05 05DAB1	77-11-21	--	68	--	--	--	--	--	--	--
A-13-05 05DAC2	79-05-31	67	--	--	--	--	--	--	--	--
A-13-05 05DBA	75-08-21	30	--	--	<10	40	<50	<50	--	<50
A-13-05 06AAA	77-01-06	--	14	240	--	--	--	--	30	--
A-13-05 06BBD1	76-12-23	--	--	650	--	--	--	--	130	--
A-13-05 06CBC2	77-04-12	--	30	1400	--	--	--	--	230	--
A-13-05 06DAA1	76-12-02	--	--	480	--	--	--	--	20	--
A-13-05 07BDA	75-07-18	20	--	--	<10	<10	<50	<50	--	<50
	75-11-19	--	--	--	--	--	--	--	--	--
	76-12-09	--	24	410	--	--	--	--	--	--
A-13-05 08BDA1	76-12-02	--	22	460	--	--	--	--	10	--
A-13-05 12CCA	77-11-21	--	62	0	--	--	--	--	50	--
A-13-05 13DBC	79-05-03	3	3	--	1	10	4	90	--	14
A-13-05 15AAA	59-03-25	--	--	--	--	--	--	--	--	--

LOCAL IDENT- I- FIER	DATE OF SAMPLE	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)
A-11-06 10A UNSURV	51-12-10	--	--	--	--	--	--
	77-12-14	--	80	1.2	--	--	--
	77-12-14	--	100	.0	--	--	--
	79-06-12	--	--	--	--	--	--
A-11-06 17C UNSURV	76-04-21	--	0	--	--	--	--
A-12-05 02C UNSURV	77-12-13	--	10	.0	--	--	--
A-12-05 10A UNSURV	77-12-13	--	40	9.0	--	--	--
A-12-05 24B UNSURV	59-02-03	--	--	--	--	--	--
	77-12-13	--	20	.0	--	--	--
A-12-06 01B UNSURV	77-12-14	--	30	.0	--	--	--
A-12-06 11D UNSURV	77-12-14	--	120	.0	--	--	--
A-12-07 14D UNSURV	52-02-15	--	--	--	--	--	--
	52-02-16	--	--	--	--	--	--
	52-07-10	--	--	--	--	--	--
	54-10-07	--	--	--	--	--	--
	55-06-30	--	--	--	--	--	--
	56-06-22	--	--	--	--	--	--
	57-05-29	--	--	--	--	--	--
	58-07-22	--	--	--	--	--	--
	59-07-15	--	--	--	--	--	--
	78-05-24	--	0	.2	--	--	--
A-13-04 12AAA	79-05-03	--	--	--	--	--	--
A-13-04 12ADD	76-12-23	--	10	--	--	--	--
A-13-05 05BAD2	76-12-01	--	0	--	--	--	--
A-13-05 05BDC	76-07-28	--	--	--	--	--	--
	79-05-31	--	--	--	--	--	--
A-13-05 05DAB1	77-11-21	--	--	--	--	--	--
A-13-05 05DAC2	79-05-31	--	--	--	--	--	--
A-13-05 05DBA	75-08-21	<50	--	<.5	<10	<10	90
A-13-05 06AAA	77-01-06	--	10	--	--	--	--
A-13-05 06BBD1	76-12-23	--	40	--	--	--	--
A-13-05 06CBC2	77-04-12	--	50	--	--	--	--
A-13-05 06DAA1	76-12-02	--	10	--	--	--	--
A-13-05 07BDA	75-07-18	<50	--	<.5	<10	<10	70
	75-11-19	--	--	--	--	--	--
	76-12-09	--	0	--	--	--	--
A-13-05 08BDA1	76-12-02	--	20	--	--	--	--
A-13-05 12CCA	77-11-21	--	8	--	--	--	--
A-13-05 13DBC	79-05-03	10	--	.1	1	0	50
A-13-05 15AAA	59-03-25	--	--	--	--	--	--

LOCAL IDENT-I-FIER	SITE	GEO-LOGIC UNIT	DATE OF SAMPLE	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG °C)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)
A-13-05 15BDB1	GW	121VERD	76-12-02	1028	640	7.6	16.0	320	59	69
A-13-05 16BAD	GW	111ALVM	76-12-07	1028	1900	7.5	18.0	800	460	140
A-13-05 17ABB2	GW	--	76-12-16	1028	800	7.0	18.5	420	9	78
A-13-05 17CAA	GW	111ALVM	77-11-21	1028	2600	--	--	1200	760	150
A-13-05 18CBB	SP	120VLCC	77-12-13	1028	675	7.4	18.5	320	55	76
A-13-05 27DCB1	GW	121VERD	77-02-02	1028	1200	7.4	19.0	620	350	100
A-13-05 29CCA	SP	400GRNT	76-12-21	1028	990	7.1	18.0	500	160	120
A-13-06 10AAD	SP	120VLCC	59-10-20	1028	467	7.5	19.0	232	0	40
A-13-06 23BBC	GW	120VLCC	66-09-22	1028	805	7.4	--	360	160	110
A-13-06 29DBB	GW	120VLCC	78-02-15	1028	400	7.4	25.0	160	0	31
A-13-07 14BAB	GW	120VLCC	66-09-22	1028	350	7.6	--	154	6	32
A-14-02H24ADD	SP	400GRCG	78-04-20	1028	440	7.0	13.0	200	0	53
A-14-03 04AAA	SP	400GRCG	78-04-18	1028	660	7.1	14.5	--	--	96
A-14-03 17DDD1	GW	111ALVM	78-03-16	1028	700	7.4	--	340	41	90
A-14-03 21BAD	GW	400GRNT	78-03-16	1028	580	6.9	16.0	250	84	73
A-14-04 02CBA	GW	121VERD	79-05-30	80020	700	7.2	20.0	--	--	--
A-14-04 02DDC	GW	121VERD	77-04-12	1028	640	7.0	16.0	300	0	59
A-14-04 03BAB1	GW	121VERD	79-05-30	80020	2400	--	--	--	--	--
A-14-04 03BBD1	GW	121VERD	79-05-30	80020	625	--	--	--	--	--
A-14-04 03BCD	GW	--	79-05-30	80020	700	--	--	--	--	--
A-14-04 03DBC1	GW	121VERD	77-04-13	1028	900	7.4	17.0	420	150	85
A-14-04 11ADD	GW	121VERD	79-05-30	80020	640	--	--	--	--	--
A-14-04 11DAA2	GW	121VERD	79-05-30	80020	700	--	--	--	--	--
A-14-04 11DBA1	GW	121VERD	79-05-30	80020	720	--	--	--	--	--
A-14-04 12CDC	GW	121VERD	79-05-30	80020	900	--	--	--	--	--
A-14-04 13BCA1	GW	121VERD	79-05-31	80020	925	--	--	--	--	--
A-14-04 13BDB1	GW	121VERD	74-01-15	9704	526	7.7	--	300	87	86
	GW	121VERD	76-01-15	9704	--	--	--	--	--	--
A-14-04 13BDD3	GW	121VERD	79-05-31	80020	840	--	--	--	--	--
A-14-04 13DAC2	GW	121VERD	79-05-30	80020	650	--	--	--	--	--
A-14-04 13DCD3	GW	111ALVM	77-03-29	1028	550	7.6	--	240	1	43
A-14-04 14ADC2	GW	121VERD	79-05-31	80020	1425	--	--	--	--	--
A-14-04 14DAD	GW	121VERD	79-05-31	80020	975	--	--	--	--	--
A-14-04 14DBB	GW	121VERD	58-10-21	1028	1700	7.5	19.5	280	1	32
A-14-04 14DBC1	GW	121VERD	77-03-30	1028	1900	7.6	20.0	360	92	58
A-14-04 14DCB1	GW	121VERD	77-04-06	1028	6000	7.6	21.0	1000	790	120
	GW	121VERD	79-05-31	80020	6000	7.8	22.5	--	--	--
A-14-04 24DAA	GW	121VERD	77-04-07	1028	700	7.3	18.0	350	18	61
	GW	121VERD	79-05-30	80020	750	7.2	19.0	--	--	--
A-14-05 01AAD	GW	121VERD	75-02-13	9704	500	7.3	--	248	0	63

LOCAL IDENT- I- FIER	DATE OF SAMPLE	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM+ POTAS- SIUM DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)
A-13-05 15BDB1	76-12-02	35	11	.3	--	1.8	320	0	78	4.9
A-13-05 16BAD	76-12-07	110	150	2.3	--	4.1	418	0	780	18
A-13-05 17ABB2	76-12-16	55	41	.9	--	1.8	503	0	50	21
A-13-05 17CAA	77-11-21	210	240	3.0	--	4.6	590	--	770	290
A-13-05 18CBB	77-12-13	31	28	.7	--	3.0	320	0	79	19
A-13-05 27DCB1	77-02-02	91	65	1.1	--	3.7	336	0	430	53
A-13-05 29CCA	76-12-21	49	29	.6	--	2.6	420	0	200	20
A-13-06 10AAD	59-10-20	32	--	.3	12	--	290	0	6.2	9.0
A-13-06 23BBC	66-09-22	23	--	--	37	--	248	0	150	60
A-13-06 29DBB	78-02-15	19	30	1.0	--	4.4	240	0	7.5	13
A-13-07 14BAB	66-09-22	18	--	--	17	--	180	0	12	22
A-14-02H24ADD	78-04-20	17	25	.8	--	23	260	0	33	15
A-14-03 04AAA	78-04-18	--	35	--	--	13	350	0	63	21
A-14-03 17DDD1	78-03-16	29	30	.7	--	2.0	370	0	61	23
A-14-03 21BAD	78-03-16	16	27	.7	--	.6	200	0	62	17
A-14-04 02CBA	79-05-30	--	--	--	--	--	--	0	--	--
A-14-04 02DDC	77-04-12	38	22	.6	--	2.7	370	0	30	15
A-14-04 03BAB1	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 03BBD1	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 03BCD	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 03DBC1	77-04-13	50	49	1.0	--	3.0	330	0	220	31
A-14-04 11ADD	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 11DAA2	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 11DBA1	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 12CDC	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 13BCA1	79-05-31	--	--	--	--	--	--	--	--	--
A-14-04 13BDB1	74-01-15	20	26	.7	--	--	260	0	57	20
	76-01-15	--	--	--	--	--	--	--	--	--
A-14-04 13BDD3	79-05-31	--	--	--	--	--	--	--	--	--
A-14-04 13DAC2	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 13DCD3	77-03-29	32	30	.8	--	3.1	290	0	47	17
A-14-04 14ADC2	79-05-31	--	--	--	--	--	--	--	--	--
A-14-04 14DAD	79-05-31	--	--	--	--	--	--	--	--	--
A-14-04 14DBB	58-10-21	48	--	--	290	--	340	0	490	80
A-14-04 14DBC1	77-03-30	51	300	6.9	--	14	320	0	520	170
A-14-04 14DCB1	77-04-06	180	1100	15	--	25	310	0	2900	260
	79-05-31	--	--	--	--	--	--	0	--	--
A-14-04 24DAA	77-04-07	49	27	.6	--	3.2	410	0	56	19
	79-05-30	--	--	--	--	--	--	0	--	--
A-14-05 01AAD	75-02-13	22	24	.7	--	--	336	0	6.0	20

LOCAL IDENT- I- FIER	DATE OF SAMPLE	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	PHOS- PHATE, ORTHO, DIS- SOLVED (MG/L AS PO4)
A-13-05 15BDB1	76-12-02	.2	22	--	378	.51	--	.28	.02	.06
A-13-05 16BAD	76-12-07	.4	33	--	1450	1.97	1.1	1.1	.05	.15
A-13-05 17ABB2	76-12-16	.3	40	--	536	.73	.14	.14	.07	.21
A-13-05 17CAA	77-11-21	.3	36	--	2000	2.72	--	2.0	.05	.15
A-13-05 18CBB	77-12-13	.3	39	--	437	.59	--	.77	.00	.00
A-13-05 27DCB1	77-02-02	.4	38	--	952	1.29	--	1.1	.10	.31
A-13-05 29CCA	76-12-21	.3	36	--	669	.91	--	.98	.05	.15
A-13-06 10AAD	59-10-20	.2	53	--	296	.40	--	--	--	--
A-13-06 23BBC	66-09-22	.2	15	--	510	--	--	--	--	--
A-13-06 29DBB	78-02-15	.2	40	--	271	.37	--	1.6	.02	.06
A-13-07 14BAB	66-09-22	.4	44	--	234	--	--	--	--	--
A-14-02H24ADD	78-04-20	.3	28	--	325	.44	--	.52	.00	.00
A-14-03 04AAA	78-04-18	.2	31	--	--	--	--	1.4	.00	.00
A-14-03 17DDD1	78-03-16	.3	35	--	464	.63	--	2.3	.04	.12
A-14-03 21BAD	78-03-16	.3	24	--	390	.53	--	16	.02	.06
A-14-04 02CBA	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 02DDC	77-04-12	.2	26	--	378	.51	--	.48	.06	.18
A-14-04 03BAB1	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 03BBD1	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 03BCD	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 03DBC1	77-04-13	.2	31	--	635	.86	--	.64	.06	.18
A-14-04 11ADD	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 11DAA2	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 11DBA1	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 12CDC	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 13BCA1	79-05-31	--	--	--	--	--	--	--	--	--
A-14-04 13BDB1	74-01-15	.8	--	--	340	--	--	--	--	--
	76-01-15	--	--	--	--	--	--	--	--	--
A-14-04 13BDD3	79-05-31	--	--	--	--	--	--	--	--	--
A-14-04 13DAC2	79-05-30	--	--	--	--	--	--	--	--	--
A-14-04 13DCD3	77-03-29	.8	67	--	383	--	--	.05	.07	.21
A-14-04 14ADC2	79-05-31	--	--	--	--	--	--	--	--	--
A-14-04 14DAD	79-05-31	--	--	--	--	--	--	--	--	--
A-14-04 14DBB	58-10-21	2.4	78	--	1190	--	--	--	--	--
A-14-04 14DBC1	77-03-30	3.4	97	--	1370	--	--	.43	.10	.31
A-14-04 14DCB1	77-04-06	2.3	68	--	4810	--	--	.04	.07	.21
	79-05-31	--	--	--	--	--	--	--	--	--
A-14-04 24DAA	77-04-07	.8	51	--	472	--	--	.49	.10	.31
	79-05-30	--	--	--	--	--	--	--	--	--
A-14-05 01AAD	75-02-13	.1	--	325	--	--	--	--	--	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
A-13-05 15BDB1	76-12-02	--	5	40	--	--	--	--	0	--
A-13-05 16BAD	76-12-07	--	11	480	--	--	--	--	10	--
A-13-05 17ABB2	76-12-16	--	16	200	--	--	--	--	10	--
A-13-05 17CAA	77-11-21	--	30	1	--	--	--	--	40	--
A-13-05 18CBB	77-12-13	--	--	40	--	--	--	--	20	--
A-13-05 27DCB1	77-02-02	--	22	320	--	--	--	--	10	--
A-13-05 29CCA	76-12-21	--	1	30	--	--	--	--	20	--
A-13-06 10AAD	59-10-20	--	--	--	--	--	--	--	--	--
A-13-06 23BBC	66-09-22	--	--	--	--	--	--	--	0	--
A-13-06 29DBB	78-02-15	--	14	60	--	--	--	--	20	--
A-13-07 14BAB	66-09-22	--	--	--	--	--	--	--	0	--
A-14-02H24ADD	78-04-20	--	--	20	--	--	--	--	0	--
A-14-03 04AAA	78-04-18	--	--	30	--	--	--	--	20	--
A-14-03 17DDD1	78-03-16	--	--	410	--	--	--	--	20	--
A-14-03 21BAD	78-03-16	--	0	40	--	--	--	--	30	--
A-14-04 02CBA	79-05-30	27	--	--	--	--	--	--	--	--
A-14-04 02DDC	77-04-12	--	--	110	--	--	--	--	40	--
A-14-04 03BAB1	79-05-30	72	--	--	--	--	--	--	--	--
A-14-04 03BBD1	79-05-30	47	--	--	--	--	--	--	--	--
A-14-04 03BCD	79-05-30	11	--	--	--	--	--	--	--	--
A-14-04 03DBC1	77-04-13	--	30	290	--	--	--	--	160	--
A-14-04 11ADD	79-05-30	24	--	--	--	--	--	--	--	--
A-14-04 11DAA2	79-05-30	27	--	--	1	0	5	0	--	5
A-14-04 11DBA1	79-05-30	21	--	--	1	10	22	0	--	23
A-14-04 12CDC	79-05-30	33	--	--	--	--	--	--	--	--
A-14-04 13BCA1	79-05-31	120	--	--	--	--	--	--	--	--
A-14-04 13BDB1	74-01-15	80	--	--	<10	<10	<50	--	<50	<50
	76-01-15	120	--	--	--	--	--	--	--	--
A-14-04 13BDD3	79-05-31	37	--	--	--	--	--	--	--	--
A-14-04 13DAC2	79-05-30	90	--	--	--	--	--	--	--	--
A-14-04 13DCD3	77-03-29	--	--	160	--	--	--	--	90	--
A-14-04 14ADC2	79-05-31	16	--	--	--	--	--	--	--	--
A-14-04 14DAD	79-05-31	41	--	--	--	--	--	--	--	--
A-14-04 14DBB	58-10-21	--	--	--	--	--	--	--	--	--
A-14-04 14DBC1	77-03-30	--	45	600	--	--	--	--	230	--
A-14-04 14DCB1	77-04-06	--	--	2700	--	--	--	--	30	--
	79-05-31	47	43	--	--	--	--	--	--	--
A-14-04 24DAA	77-04-07	--	--	180	--	--	--	--	10	--
	79-05-30	120	120	--	--	--	--	--	--	--
A-14-05 01AAD	75-02-13	30	--	--	--	--	--	--	--	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	SELE-NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)
A-13-05 15BDB1	76-12-02	--	10	--	--	--	--
A-13-05 16BAD	76-12-07	--	10	--	--	--	--
A-13-05 17ABB2	76-12-16	--	0	--	--	--	--
A-13-05 17CAA	77-11-21	--	8	--	--	--	--
A-13-05 18CBB	77-12-13	--	10	.0	--	--	--
A-13-05 27DCB1	77-02-02	--	20	--	--	--	--
A-13-05 29CCA	76-12-21	--	10	--	--	--	--
A-13-06 10AAD	59-10-20	--	--	--	--	--	--
A-13-06 23BBC	66-09-22	--	--	--	--	--	--
A-13-06 29DBB	78-02-15	--	20	.1	--	--	--
A-13-07 14BAB	66-09-22	--	--	--	--	--	--
A-14-02H24ADD	78-04-20	--	0	.0	--	--	--
A-14-03 04AAA	78-04-18	--	0	.0	--	--	--
A-14-03 17DDD1	78-03-16	--	40	--	--	--	--
A-14-03 21BAD	78-03-16	--	50	--	--	--	--
A-14-04 02CBA	79-05-30	--	--	--	--	--	--
A-14-04 02DDC	77-04-12	--	0	--	--	--	--
A-14-04 03BAB1	79-05-30	--	--	--	--	--	--
A-14-04 03BBD1	79-05-30	--	--	--	--	--	--
A-14-04 03BCD	79-05-30	--	--	--	--	--	--
A-14-04 03DBC1	77-04-13	--	0	--	--	--	--
A-14-04 11ADD	79-05-30	--	--	--	--	--	--
A-14-04 11DAA2	79-05-30	0	--	.0	5	0	70
A-14-04 11DBA1	79-05-30	0	--	.0	3	0	80
A-14-04 12CDC	79-05-30	--	--	--	--	--	--
A-14-04 13BCA1	79-05-31	--	--	--	--	--	--
A-14-04 13BDB1	74-01-15	<50	--	<.5	<10	<10	300
	76-01-15	--	--	--	--	--	--
A-14-04 13BDD3	79-05-31	--	--	--	--	--	--
A-14-04 13DAC2	79-05-30	--	--	--	--	--	--
A-14-04 13DCD3	77-03-29	--	0	--	--	--	--
A-14-04 14ADC2	79-05-31	--	--	--	--	--	--
A-14-04 14DAD	79-05-31	--	--	--	--	--	--
A-14-04 14DBB	58-10-21	--	--	--	--	--	--
A-14-04 14DBC1	77-03-30	--	10	--	--	--	--
A-14-04 14DCB1	77-04-06	--	110	--	--	--	--
	79-05-31	--	--	--	--	--	--
A-14-04 24DAA	77-04-07	--	0	--	--	--	--
	79-05-30	--	--	--	--	--	--
A-14-05 01AAD	75-02-13	--	--	--	--	--	--

LOCAL IDENT-I-FIER	SITE	GEO-LOGIC UNIT	DATE OF SAMPLE	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG°C)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)
A-14-05 01BBC2	GW	121VERD	79-05-02	80020	710	7.2	18.0	--	--	--
A-14-05 01BCD	GW	121VERD	75-02-13	9704	645	7.3	--	324	0	74
A-14-05 01CBB	GW	121VERD	79-05-02	80020	660	7.1	18.0	300	0	69
A-14-05 02ADA	GW	121VERD	79-06-14	80020	730	--	--	--	--	--
A-14-05 02BAB1	GW	121VERD	78-01-24	1028	650	7.2	19.0	300	0	70
A-14-05 02BAB2	GW	121VERD	79-05-02	80020	650	7.2	20.0	--	--	--
A-14-05 02BAD	GW	121VERD	72-04-27	9704	588	8.3	--	320	0	82
A-14-05 02BBA	GW	121VERD	74-08-08	9704	909	7.8	--	280	0	71
A-14-05 02CAC	GW	121VERD	78-02-09	1028	675	7.1	23.0	290	0	70
A-14-05 02CBC1	GW	121VERD	79-05-02	80020	600	--	--	--	--	--
A-14-05 02CDA	GW	121VERD	79-05-02	80020	670	7.1	21.0	--	--	--
A-14-05 04AAA	GW	121VERD	78-03-23	1028	475	7.6	18.0	250	0	52
A-14-05 17AAC	GW	121VERD	58-11-25	1028	552	7.4	18.0	266	0	49
	GW	121VERD	79-05-02	80020	660	7.1	19.0	--	--	--
A-14-05 19CAC	GW	121VERD	79-05-30	80020	2300	--	--	--	--	--
A-14-05 19CBA	GW	121VERD	77-04-07	1028	640	7.5	19.0	290	16	44
	GW	121VERD	79-05-02	80020	725	--	--	--	--	--
A-14-05 31CCA1	GW	121VERD	79-05-03	80020	1150	7.1	22.0	--	--	--
A-14-05 31DAD	GW	121VERD	77-04-06	1028	1700	7.0	25.5	490	50	100
A-14-05 31DBD1	GW	121VERD	77-03-16	1028	1500	7.0	29.5	400	29	82
	GW	121VERD	79-05-03	80020	1500	--	--	--	--	--
A-14-05 31DDB	GW	121VERD	79-05-03	80020	1425	--	--	--	--	--
A-14-05 32BBB1	GW	121VERD	74-01-15	9704	909	7.6	--	460	78	110
A-14-05 32BDC	GW	121VERD	79-06-14	80020	2100	--	--	--	--	--
A-14-05 32CBB1	GW	121VERD	74-01-15	9704	833	7.5	--	384	69	85
A-14-05 32CCC	GW	121VERD	77-03-31	1028	840	7.1	19.5	360	2	66
A-14-08 32A UNSURV	SP	310CCNN	59-05-28	1028	401	8.0	--	218	0	51
A-14-09 31DDC	SP	310CCNN	59-05-27	1028	418	7.8	11.0	228	0	55
A-14-10 30ACA	GW	310CCNN	75-08-26	9704	476	--	--	272	0	73
A-15-02 02D UNSURV	SP	341MRTN	78-04-20	1028	365	7.6	16.0	230	26	48
A-15-03 02CBB	GW	121VERD	58-10-09	1028	505	7.4	--	228	57	35
A-15-03 04DAC	GW	121VERD	73-08-27	9704	400	7.8	--	224	6	50
A-15-03 05BAA	GW	121VERD	78-02-24	1028	580	7.2	29.0	330	85	75
	GW	121VERD	78-04-04	1028	650	7.3	29.0	320	70	69
A-15-03 11BCC	GW	121VERD	71-12-03	9704	333	8.0	--	188	8	30
A-15-03 11DAD	GW	121VERD	78-04-05	1028	825	7.4	--	370	0	43
A-15-03 12AAB	GW	121VERD	77-08-23	1028	500	7.7	20.0	250	19	47
A-15-03 12ADD2	GW	121VERD	77-08-17	1028	1050	7.6	18.0	470	39	71
A-15-03 12BBA	GW	121VERD	77-08-24	1028	600	7.7	19.0	270	17	41
A-15-03 13CDA	GW	121VERD	77-12-20	1028	490	7.6	20.5	240	22	33

Table 13.--Chemical analysis of water from selected wells and springs in the upper Verde River area—Continued

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM+ POTAS-SIUM DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)
A-14-05 01BBC2	79-05-02	--	--	--	--	--	--	0	--	--
A-14-05 01BCD	75-02-13	33	36	.9	--	--	441	0	12	26
A-14-05 01CBB	79-05-02	31	34	.9	40	6.1	400	0	9.5	26
A-14-05 02ADA	79-06-14	--	--	--	--	--	--	--	--	--
A-14-05 02BAB1	78-01-24	31	33	.8	--	4.4	400	0	11	20
A-14-05 02BAB2	79-05-02	--	--	--	--	--	--	0	--	--
A-14-05 02BAD	72-04-27	28	32	.6	--	--	397	0	8.0	26
A-14-05 02BBA	74-08-08	24	31	.8	--	--	380	0	8.0	22
A-14-05 02CAC	78-02-09	29	29	.7	--	4.4	400	0	9.3	25
A-14-05 02CBC1	79-05-02	--	--	--	--	--	--	--	--	--
A-14-05 02CDA	79-05-02	--	--	--	--	--	--	0	--	--
A-14-05 04AAA	78-03-23	28	13	.4	--	2.3	300	0	4.5	9.7
A-14-05 17AAC	58-11-25	35	--	--	20	--	335	0	9.5	17
	79-05-02	--	--	--	--	--	--	0	--	--
A-14-05 19CAC	79-05-30	--	--	--	--	--	--	--	--	--
A-14-05 19CBA	77-04-07	43	25	.6	--	3.5	330	0	53	15
	79-05-02	--	--	--	--	--	--	--	--	--
A-14-05 31CCA1	79-05-03	--	--	--	--	--	--	0	--	--
A-14-05 31DAD	77-04-06	59	230	4.5	--	15	540	0	360	130
A-14-05 31DBD1	77-03-16	47	180	3.9	--	13	450	0	290	120
	79-05-03	--	--	--	--	--	--	--	--	--
A-14-05 31DDB	79-05-03	--	--	--	--	--	--	--	--	--
A-14-05 32BBB1	74-01-15	47	86	1.7	--	--	466	0	90	44
A-14-05 32BDC	79-06-14	--	--	--	--	--	--	--	--	--
A-14-05 32CBB1	74-01-15	41	89	2.0	--	--	360	0	120	50
A-14-05 32CCC	77-03-31	48	40	.9	--	6.2	440	0	69	20
A-14-08 32A UNSURV	59-05-28	22	--	.2	5.5	--	268	0	1.6	6.0
A-14-09 31DDC	59-05-27	22	--	.1	5.1	--	284	0	.6	4.0
A-14-10 30ACA	75-08-26	22	2.0	.1	--	--	334	--	--	4.0
A-15-02 02D UNSURV	78-04-20	27	6.4	.2	--	1.4	250	0	31	3.6
A-15-03 02CBB	58-10-09	34	--	.4	16	--	208	0	43	31
A-15-03 04DAC	73-08-27	24	11	.3	--	--	266	0	10	12
A-15-03 05BAA	78-02-24	35	15	.4	--	1.0	300	0	--	--
	78-04-04	35	13	.3	--	1.0	300	0	64	18
A-15-03 11BCC	71-12-03	27	9.0	.3	--	--	222	0	6.0	9.0
A-15-03 11DAD	78-04-05	63	35	.8	--	1.3	460	0	43	18
A-15-03 12AAB	77-08-23	32	15	.4	--	2.0	280	0	6.0	27
A-15-03 12ADD2	77-08-17	72	62	1.2	--	2.7	530	0	110	49
A-15-03 12BBA	77-08-24	41	24	.6	--	2.4	310	0	26	23
A-15-03 13CDA	77-12-20	39	15	.4	--	1.7	270	0	11	24

LOCAL IDENT-I-FIER	DATE OF SAMPLE	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
A-14-05 01BBC2	79-05-02	--	--	--	--	--	--	--	--	--
A-14-05 01BCD	75-02-13	.4	--	415	--	--	--	--	--	--
A-14-05 01CBB	79-05-02	.5	25	--	401	.55	--	.50	--	--
A-14-05 02ADA	79-06-14	--	--	--	--	--	--	--	--	--
A-14-05 02BAB1	78-01-24	.5	26	--	395	.54	--	.23	.02	.06
A-14-05 02BAB2	79-05-02	--	--	--	--	--	--	--	--	--
A-14-05 02BAD	72-04-27	.4	--	--	380	--	--	--	--	--
A-14-05 02BBA	74-08-08	.5	--	--	565	--	--	--	--	--
A-14-05 02CAC	78-02-09	.4	25	--	391	.53	--	.25	.00	.00
A-14-05 02CBC1	79-05-02	--	--	--	--	--	--	--	--	--
A-14-05 02CDA	79-05-02	--	--	--	--	--	--	--	--	--
A-14-05 04AAA	78-03-23	.2	23	--	283	.38	--	.43	.02	.06
A-14-05 17AAC	58-11-25	.2	25	--	321	--	--	--	--	--
	79-05-02	--	--	--	--	--	--	--	--	--
A-14-05 19CAC	79-05-30	--	--	--	--	--	--	--	--	--
A-14-05 19CBA	77-04-07	1.0	66	--	416	--	--	.43	.10	.31
	79-05-02	--	--	--	--	--	--	--	--	--
A-14-05 31CCA1	79-05-03	--	--	--	--	--	--	--	--	--
A-14-05 31DAD	77-04-06	1.9	100	--	1260	--	--	.03	.14	.43
A-14-05 31DBD1	77-03-16	.7	99	--	1050	1.43	--	.05	.07	.21
	79-05-03	--	--	--	--	--	--	--	--	--
A-14-05 31DDB	79-05-03	--	--	--	--	--	--	--	--	--
A-14-05 32BBB1	74-01-15	1.5	--	--	565	--	5.0	--	--	--
A-14-05 32BDC	79-06-14	--	--	--	--	--	--	--	--	--
A-14-05 32CBB1	74-01-15	1.6	--	--	525	--	.90	--	--	--
A-14-05 32CCC	77-03-31	1.0	42	--	513	--	--	.88	.08	.25
A-14-08 32A UNSURV	59-05-28	.0	20	--	239	--	--	--	--	--
A-14-09 31DDC	59-05-27	.1	21	--	248	.34	.07	--	--	--
A-14-10 30ACA	75-08-26	.1	--	283	265	--	--	--	--	--
A-15-02 02D UNSURV	78-04-20	.1	31	--	276	.38	--	.91	.04	.12
A-15-03 02CBB	58-10-09	.2	58	--	321	--	--	--	--	--
A-15-03 04DAC	73-08-27	.3	--	--	250	--	--	--	--	--
A-15-03 05BAA	78-02-24	--	--	--	--	--	--	1.4	.01	.03
	78-04-04	.1	24	--	379	.52	--	1.5	.01	.03
A-15-03 11BCC	71-12-03	.5	--	--	210	--	--	--	--	--
A-15-03 11DAD	78-04-05	.5	74	--	506	.69	--	.26	.01	.03
A-15-03 12AAB	77-08-23	.2	42	--	312	.42	--	.47	.03	.09
A-15-03 12ADD2	77-08-17	.3	54	--	699	.95	--	3.7	.09	.28
A-15-03 12BBA	77-08-24	.3	62	--	362	.52	--	2.1	.07	.21
A-15-03 13CDA	77-12-20	.4	67	--	327	.44	--	.51	.02	.06

LOCAL IDENT- I- FIER	DATE OF SAMPLE	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BORON, DIS- SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)
A-14-05 01BBC2	79-05-02	62	29	--	--	--	--	--	--	--
A-14-05 01BCD	75-02-13	50	--	--	--	--	--	--	--	--
A-14-05 01CBB	79-05-02	32	30	420	--	--	--	--	10	--
A-14-05 02ADA	79-06-14	7	--	--	--	--	--	--	--	--
A-14-05 02BAB1	78-01-24	--	49	420	--	--	--	--	30	--
A-14-05 02BAB2	79-05-02	58	46	--	--	--	--	--	--	--
A-14-05 02BAD	72-04-27	30	--	--	--	--	--	<50	--	--
A-14-05 02BBA	74-08-08	50	--	--	--	--	--	200	--	--
A-14-05 02CAC	78-02-09	--	20	380	--	--	--	--	30	--
A-14-05 02CBC1	79-05-02	55	--	--	--	--	--	--	--	--
A-14-05 02CDA	79-05-02	35	--	--	--	--	--	--	--	--
A-14-05 04AAA	78-03-23	--	10	140	--	--	--	--	10	--
A-14-05 17AAC	58-11-25	--	--	--	--	--	--	--	--	--
	79-05-02	14	14	--	0	0	4	50	--	19
A-14-05 19CAC	79-05-30	240	--	--	--	--	--	--	--	--
A-14-05 19CBA	77-04-07	--	70	190	--	--	--	--	0	--
	79-05-02	83	--	--	--	--	--	--	--	--
A-14-05 31CCA1	79-05-03	59	60	--	--	--	--	--	--	--
A-14-05 31DAD	77-04-06	--	--	530	--	--	--	--	30	--
A-14-05 31DBD1	77-03-16	--	120	430	--	--	--	--	150	--
	79-05-03	79	--	--	--	--	--	--	--	--
A-14-05 31DDB	79-05-03	58	--	--	--	--	--	--	--	--
A-14-05 32BBB1	74-01-15	40	--	--	<10	<10	<50	<50	--	<50
A-14-05 32BDC	79-06-14	9	--	--	--	--	--	--	--	--
A-14-05 32CBB1	74-01-15	80	--	--	<10	<10	<10	<50	--	<50
A-14-05 32CCC	77-03-31	--	100	200	--	--	--	--	10	--
A-14-06 32A UNSURV	59-05-28	--	--	--	--	--	--	--	--	--
A-14-09 31DDC	59-05-27	--	--	--	--	--	--	--	--	--
A-14-10 30ACA	75-08-26	--	--	--	--	--	--	--	--	--
A-15-02 02D UNSURV	78-04-20	--	6	20	--	--	--	--	10	--
A-15-03 02CBB	58-10-09	--	--	--	--	--	--	--	--	--
A-15-03 04DAC	73-08-27	<10	--	--	<10	<10	<50	<50	--	<50
A-15-03 05BAA	78-02-24	--	15	--	--	--	--	--	10	--
	78-04-04	--	13	20	--	--	--	--	0	--
A-15-03 11BCC	71-12-03	<10	--	--	--	<10	<50	<50	--	<50
A-15-03 11DAD	78-04-05	--	6	200	--	--	--	--	30	--
A-15-03 12AAB	77-08-23	--	6	50	--	--	--	--	10	--
A-15-03 12ADD2	77-08-17	--	13	400	--	--	--	--	0	--
A-15-03 12BBA	77-08-24	--	27	120	--	--	--	--	10	--
A-15-03 13CDA	77-12-20	--	12	100	--	--	--	--	10	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	SELE-NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)
A-14-05 01BBC2	79-05-02	--	--	--	--	--	--
A-14-05 01BCD	75-02-13	--	--	--	--	--	--
A-14-05 01CBB	79-05-02	--	10	--	--	--	--
A-14-05 02ADA	79-06-14	--	--	--	--	--	--
A-14-05 02BAB1	78-01-24	--	0	--	--	--	--
A-14-05 02BAB2	79-05-02	--	--	--	--	--	--
A-14-05 02BAD	72-04-27	<50	--	--	--	--	--
A-14-05 02BBA	74-08-08	--	--	--	--	--	--
A-14-05 02CAC	78-02-09	--	20	--	--	--	--
A-14-05 02CBC1	79-05-02	--	--	--	--	--	--
A-14-05 02CDA	79-05-02	--	--	--	--	--	--
A-14-05 04AAA	78-03-23	--	10	--	--	--	--
A-14-05 17AAC	58-11-25	--	--	--	--	--	--
	79-05-02	10	--	.0	1	0	70
A-14-05 19CAC	79-05-30	--	--	--	--	--	--
A-14-05 19CBA	77-04-07	--	0	--	--	--	--
	79-05-02	--	--	--	--	--	--
A-14-05 31CCA1	79-05-03	--	--	--	--	--	--
A-14-05 31DAD	77-04-06	--	10	--	--	--	--
A-14-05 31DBD1	77-03-16	--	10	--	--	--	--
	79-05-03	--	--	--	--	--	--
A-14-05 31DDB	79-05-03	--	--	--	--	--	--
A-14-05 32BBB1	74-01-15	<50	--	<.5	--	<10	300
A-14-05 32BDC	79-06-14	--	--	--	--	--	--
A-14-05 32CBB1	74-01-15	<50	--	<.5	<10	<10	200
A-14-05 32CCC	77-03-31	--	0	--	--	--	--
A-14-08 32A UNSURV	59-05-28	--	--	--	--	--	--
A-14-09 31DDC	59-05-27	--	--	--	--	--	--
A-14-10 30ACA	75-08-26	--	--	--	--	--	--
A-15-02 02D UNSURV	78-04-20	--	0	--	--	--	--
A-15-03 02CBB	58-10-09	--	--	--	--	--	--
A-15-03 04DAC	73-08-27	<50	--	.5	<10	<10	<50
A-15-03 05BAA	78-02-24	--	10	.0	--	--	--
	78-04-04	--	0	.0	--	--	--
A-15-03 11BCC	71-12-03	<50	--	--	--	--	--
A-15-03 11DAD	78-04-05	--	10	--	--	--	--
A-15-03 12AAB	77-08-23	--	20	--	--	--	--
A-15-03 12ADD2	77-08-17	--	0	--	--	--	--
A-15-03 12BBA	77-08-24	--	30	--	--	--	--
A-15-03 13CDA	77-12-20	--	0	--	--	--	--

Table 13.--Chemical analysis of water from selected wells and springs in the upper Verde River area—Continued

LOCAL IDENT-I-FIER	SITE	GEO-LOGIC UNIT	DATE OF SAMPLE	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG °C)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)
A-15-03 15CCD	GW	121VERD	78-03-23	1028	540	7.6	--	290	0	30
A-15-03 20BAB	GW	121VERD	78-04-05	1028	625	7.4	--	310	55	63
A-15-03 21AAD1	GW	121VERD	58-10-16	1028	686	7.4	20.0	312	0	39
A-15-03 23BDD	GW	121VERD	78-03-23	1028	440	7.9	23.5	220	13	33
A-15-03 29ACA	SP	121VERD	59-11-13	1028	644	8.0	13.0	304	0	72
A-15-04 02BAA1	GW	121VERD	79-05-01	80020	1500	--	--	--	--	--
A-15-04 02BCA1	GW	121VERD	77-06-28	1028	1200	6.6	21.5	520	0	130
A-15-04 02BDC	GW	121VERD	77-06-28	1028	580	7.4	21.0	230	0	55
A-15-04 02CCB2	GW	121VERD	59-08-21	1028	487	7.3	19.0	222	0	64
A-15-04 02CCC2	GW	121VERD	59-08-21	1028	607	7.2	20.5	250	0	64
A-15-04 03ACA	GW	121VERD	77-08-02	1028	1500	6.4	27.5	710	0	170
	GW	121VERD	79-05-01	80020	1550	6.6	28.0	--	--	--
A-15-04 03BDA	GW	121VERD	77-06-16	1028	780	7.0	21.0	360	0	94
A-15-04 03CAA1	GW	121VERD	79-05-01	80020	1000	6.6	20.0	--	--	--
A-15-04 03DAA2	GW	121VERD	79-05-01	80020	640	--	--	--	--	--
A-15-04 03DAB1	GW	121VERD	77-06-16	1028	1350	6.8	--	620	0	160
	GW	121VERD	79-05-01	80020	1200	6.9	18.0	--	--	--
A-15-04 03DDD	GW	121VERD	79-05-01	80020	530	--	--	--	--	--
A-15-04 04AAA1	GW	121VERD	77-06-14	1028	850	7.3	21.0	270	0	47
	GW	121VERD	79-05-01	80020	750	7.4	19.5	--	--	--
A-15-04 04AAD1	GW	121VERD	77-06-14	1028	650	7.0	20.0	320	0	81
A-15-04 04ACA	SP	121VERD	59-02-06	1028	669	7.9	--	334	22	78
	SP	121VERD	77-06-09	1028	700	7.2	19.0	360	22	84
A-15-04 04DAD	GW	121VERD	77-06-09	1028	585	7.2	19.0	280	21	64
A-15-04 09ADD	GW	121VERD	77-07-21	1028	900	6.7	22.0	430	0	110
A-15-04 10DCA1	GW	121VERD	79-05-01	80020	650	7.2	19.5	--	--	--
A-15-04 11BBD1	GW	121VERD	77-06-29	1028	1100	6.8	21.0	470	0	110
A-15-04 12ABB	GW	121VERD	74-07-31	1028	449	7.9	--	150	0	31
	GW	121VERD	74-08-20	1028	350	8.6	--	110	64	30
	GW	121VERD	74-08-27	1028	779	7.5	--	360	0	81
	GW	121VERD	74-10-11	1028	650	8.0	--	270	0	36
	GW	310SUPI	74-11-14	1028	1050	7.0	--	520	200	--
A-15-04 15ACA	GW	121VERD	77-06-29	1028	1200	6.5	21.0	560	0	140
A-15-04 15DAC	GW	121VERD	77-07-27	1028	1375	6.6	21.5	700	0	170
A-15-04 18ABB	GW	121VERD	77-06-17	1028	470	7.8	19.5	210	14	35
A-15-04 19AAA	GW	121VERD	77-08-02	1028	540	7.4	20.5	270	25	41
A-15-04 22BCC	GW	121VERD	77-07-27	1028	510	7.6	19.0	250	0	55
A-15-04 33DCB	GW	121VERD	58-12-09	1028	3070	7.4	20.0	2110	1940	185
	GW	121VERD	77-06-09	1028	650	7.8	22.0	280	46	38
A-15-05 11AAB	SP	310SUPI	74-06-04	1028	451	7.7	24.0	190	0	44

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM+ POTAS-SIUM DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)
A-15-03 15CCD	78-03-23	53	18	.5	--	1.4	360	0	6.6	13
A-15-03 20BAB	78-04-05	36	9.2	.2	--	1.0	330	0	28	8.7
A-15-03 21AAD1	58-10-16	52	--	1.0	39	--	436	0	8.6	20
A-15-03 23BDD	78-03-23	33	10	.3	--	1.2	250	0	7.2	11
A-15-03 29ACA	59-11-13	30	--	.7	27	--	378	0	25	18
A-15-04 02BAA1	79-05-01	--	--	--	--	--	--	--	--	--
A-15-04 02BCA1	77-06-28	48	71	1.4	--	5.7	700	0	23	47
A-15-04 02BDC	77-06-28	23	36	1.0	--	1.4	330	0	14	10
A-15-04 02CCB2	59-08-21	15	--	.6	20	--	297	0	4.1	10
A-15-04 02CCC2	59-08-21	22	--	1.2	42	--	379	0	16	9.0
A-15-04 03ACA	77-08-02	69	110	1.8	--	10	980	0	45	83
	79-05-01	--	--	--	--	--	--	0	--	--
A-15-04 03BDA	77-06-16	30	29	.7	--	3.0	450	0	14	24
A-15-04 03CAA1	79-05-01	--	--	--	--	--	--	0	--	--
A-15-04 03DAA2	79-05-01	--	--	--	--	--	--	--	--	--
A-15-04 03DAB1	77-06-16	54	60	1.4	--	7.1	820	0	34	60
	79-05-01	--	--	--	--	--	--	0	--	--
A-15-04 03DDD	79-05-01	--	--	--	--	--	--	--	--	--
A-15-04 04AAA1	77-06-14	36	75	2.0	--	9.2	430	0	12	39
	79-05-01	--	--	--	--	--	--	0	--	--
A-15-04 04AAD1	77-06-14	28	23	.6	--	2.5	410	0	9.8	18
A-15-04 04ACA	59-02-06	34	--	.5	20	--	380	0	12	38
	77-06-09	36	22	.5	--	1.8	410	0	4.0	39
A-15-04 04DAD	77-06-09	28	19	.5	--	1.8	310	0	4.0	30
A-15-04 09ADD	77-07-21	38	48	1.0	--	6.5	570	0	20	31
A-15-04 10DCA1	79-05-01	--	--	--	--	--	--	0	--	--
A-15-04 11BBD1	77-06-29	47	67	1.3	--	4.6	630	0	19	48
A-15-04 12ABB	74-07-31	17	43	1.5	--	5.0	258	0	21	12
	74-08-20	8.6	23	1.0	--	3.8	52	2	84	15
	74-08-27	38	36	.8	--	6.2	444	0	20	28
	74-10-11	44	52	1.4	--	7.0	407	0	13	26
	74-11-14	--	--	--	--	--	--	0	--	--
A-15-04 15ACA	77-06-29	50	63	1.2	--	7.8	720	0	25	48
A-15-04 15DAC	77-07-27	67	74	1.2	--	9.5	910	0	24	59
A-15-04 18ABB	77-08-17	30	13	.4	--	2.1	240	0	9.7	30
A-15-04 19AAA	77-08-02	41	31	.8	--	2.0	300	0	34	41
A-15-04 22BCC	77-07-27	28	17	.5	--	1.2	310	0	6.8	13
A-15-04 33DCB	58-12-09	401	--	.6	67	--	212	0	1910	65
	77-06-09	46	27	.7	--	4.3	290	0	64	22
A-15-05 11AAB	74-06-04	20	16	.5	--	1.3	234	0	5.9	21

LOCAL IDENT-I-FIER	DATE OF SAMPLE	FLUORIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
A-15-03 15CCD	78-03-23	.5	60	--	361	.49	--	.13	.00	.00
A-15-03 20BAB	78-04-05	.1	33	--	345	.47	--	.63	.01	.03
A-15-03 21AAD1	58-10-16	.5	56	--	429	--	--	--	--	--
A-15-03 23BDD	78-03-23	.5	57	--	277	.38	--	.28	.00	.00
A-15-03 29ACA	59-11-13	.3	40	--	400	.54	--	--	--	--
A-15-04 02BAA1	79-05-01	--	--	--	--	--	--	--	--	--
A-15-04 02BCA1	77-06-28	.4	16	--	687	.93	--	--	--	--
A-15-04 02BDC	77-06-28	.5	15	--	318	.43	--	--	--	--
A-15-04 02CCB2	59-08-21	.2	23	--	266	.39	--	--	--	--
A-15-04 02CCC2	59-08-21	.6	20	--	361	.49	--	--	--	--
A-15-04 03ACA	77-08-02	.5	14	--	967	1.34	--	.12	.07	.21
	79-05-01	--	--	--	--	--	--	--	--	--
A-15-04 03BDA	77-06-16	.2	15	--	434	--	--	.74	.04	.12
A-15-04 03CAA1	79-05-01	--	--	--	--	--	--	--	--	--
A-15-04 03DAA2	79-05-01	--	--	--	--	--	--	--	--	--
A-15-04 03DAB1	77-06-16	.4	15	--	818	--	--	.65	.06	.16
	79-05-01	--	--	--	--	--	--	--	--	--
A-15-04 03DDD	79-05-01	--	--	--	--	--	--	--	--	--
A-15-04 04AAA1	77-06-14	.2	58	--	489	--	--	.19	.05	.15
	79-05-01	--	--	--	--	--	--	--	--	--
A-15-04 04AAD1	77-06-14	.2	17	--	384	--	--	.43	.02	.06
A-15-04 04ACA	59-02-06	.2	19	--	368	.53	--	--	--	--
	77-06-09	.2	18	--	408	--	--	.02	.01	.03
A-15-04 04DAD	77-06-09	.2	18	--	319	--	--	.28	.02	.06
A-15-04 09ADD	77-07-21	.5	22	--	558	--	--	.18	.04	.12
A-15-04 10DCA1	79-05-01	--	--	--	--	--	--	--	--	--
A-15-04 11BBD1	77-06-29	.2	29	--	636	.87	--	--	--	--
A-15-04 12ABB	74-07-31	.5	19	247	276	.34	--	.13	.02	.06
	74-08-20	1.9	16	211	211	.29	--	.07	.07	.21
	74-08-27	.6	12	449	441	.61	--	.01	.01	.03
	74-10-11	.3	11	383	392	.52	--	.00	.00	.00
	74-11-14	.4	18	661	--	--	--	--	.01	.03
A-15-04 15ACA	77-06-29	.4	25	--	715	.97	--	--	--	--
A-15-04 15DAC	77-07-27	.4	37	--	891	--	--	.40	.06	.18
A-15-04 18ABB	77-06-17	.3	62	--	322	--	--	.31	.06	.18
A-15-04 19AAA	77-06-02	.3	60	--	401	.55	--	.55	.05	.15
A-15-04 22BCC	77-07-27	.2	64	--	338	--	--	.02	.06	.18
A-15-04 33DCB	58-12-09	.4	42	--	2760	3.78	--	--	--	--
	77-06-09	1.2	66	--	412	--	--	.10	.06	.18
A-15-05 11AAB	74-06-04	.0	21	231	245	.31	.01	.01	.02	.06

LOCAL IDENT-I-FIER	DATE OF SAMPLE	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
A-15-03 15CCD	78-03-23	--	3	40	--	--	--	--	10	--
A-15-03 20BAB	78-04-05	--	3	20	--	--	--	--	10	--
A-15-03 21AAD1	58-10-16	--	--	--	--	--	--	--	--	--
A-15-03 23BDD	78-03-23	--	4	50	--	--	--	--	0	--
A-15-03 29ACA	59-11-13	--	--	--	--	--	--	--	--	--
A-15-04 02BAA1	79-05-01	35	--	--	--	--	--	--	--	--
A-15-04 02BCA1	77-06-28	--	38	500	--	--	--	--	10	--
A-15-04 02BDC	77-06-28	--	--	190	--	--	--	--	10	--
A-15-04 02CCB2	59-08-21	--	--	--	--	--	--	--	--	--
A-15-04 02CCC2	59-08-21	--	--	--	--	--	--	--	--	--
A-15-04 03ACA	77-08-02	--	1	880	--	--	--	--	540	--
	79-05-01	92	64	--	1	0	3	380	--	15
A-15-04 03BDA	77-06-16	--	--	180	--	--	--	--	10	--
A-15-04 03CAA1	79-05-01	43	--	--	--	--	--	--	--	--
A-15-04 03DAA2	79-05-01	58	--	--	--	--	--	--	--	--
A-15-04 03DAB1	77-06-16	--	42	600	--	--	--	--	20	--
	79-05-01	33	32	--	--	--	--	--	--	--
A-15-04 03DDD	79-05-01	60	--	--	--	--	--	--	--	--
A-15-04 04AAA1	77-06-14	--	30	180	--	--	--	--	10	--
	79-05-01	62	57	--	--	--	--	--	--	--
A-15-04 04AAD1	77-06-14	--	42	130	--	--	--	--	10	--
A-15-04 04ACA	59-02-06	--	--	--	--	--	--	--	--	--
	77-06-09	--	--	70	--	--	--	--	370	--
A-15-04 04DAD	77-06-09	--	--	40	--	--	--	--	10	--
A-15-04 09ADD	77-07-21	--	11	320	--	--	--	--	0	--
A-15-04 10DCA1	79-05-01	24	--	--	--	--	--	--	--	--
A-15-04 11BBD1	77-06-29	--	7	300	--	--	--	--	10	--
A-15-04 12ABB	74-07-31	--	--	90	--	--	--	--	40	--
	74-08-20	--	--	150	--	--	--	--	20	--
	74-08-27	--	--	420	--	--	--	--	20	--
	74-10-11	--	--	460	--	--	--	--	10	--
	74-11-14	--	--	700	--	--	--	--	60	--
A-15-04 15ACA	77-06-29	--	--	400	--	--	--	--	10	--
A-15-04 15DAC	77-07-27	--	6	300	--	--	--	--	10	--
A-15-04 18ABB	77-08-17	--	21	50	--	--	--	--	10	--
A-15-04 19AAA	77-08-02	--	19	230	--	--	--	--	10	--
A-15-04 22BCC	77-07-27	--	11	50	--	--	--	--	20	--
A-15-04 33DCB	58-12-09	--	--	--	--	--	--	--	--	--
	77-06-09	--	70	290	--	--	--	--	10	--
A-15-05 11AAB	74-06-04	--	--	80	--	--	--	--	20	--

Table 13.--Chemical analysis of water from selected wells and springs in the upper Verde River area—Continued

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	SELE-NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)
A-15-03 15CCD	78-03-23	--	10	--	--	--	--
A-15-03 20DAB	78-04-05	--	0	.0	--	--	--
A-15-03 21AAD1	58-10-16	--	--	--	--	--	--
A-15-03 23BDD	78-03-23	--	0	--	--	--	--
A-15-03 29ACA	59-11-13	--	--	--	--	--	--
A-15-04 02BAA1	79-05-01	--	--	--	--	--	--
A-15-04 02BCA1	77-06-28	--	8	--	--	--	--
A-15-04 02BDC	77-06-28	--	4	--	--	--	--
A-15-04 02CCB2	59-08-21	--	--	--	--	--	--
A-15-04 02CCC2	59-08-21	--	--	--	--	--	--
A-15-04 03ACA	77-08-02	--	40	--	--	--	--
	79-05-01	10	--	.2	1	0	30
A-15-04 03BDA	77-06-16	--	0	--	--	--	--
A-15-04 03CAA1	79-05-01	--	--	--	--	--	--
A-15-04 03DAA2	79-05-01	--	--	--	--	--	--
A-15-04 03DAB1	77-06-16	--	0	--	--	--	--
	79-05-01	--	--	--	--	--	--
A-15-04 03DDD	79-05-01	--	--	--	--	--	--
A-15-04 04AAA1	77-06-14	--	0	--	--	--	--
	79-05-01	--	--	--	--	--	--
A-15-04 04AAD1	77-06-14	--	0	--	--	--	--
A-15-04 04ACA	59-02-06	--	--	--	--	--	--
	77-06-09	--	170	--	--	--	--
A-15-04 04DAD	77-06-09	--	0	--	--	--	--
A-15-04 09ADD	77-07-21	--	50	--	--	--	--
A-15-04 10DCA1	79-05-01	--	--	--	--	--	--
A-15-04 11BBD1	77-06-29	--	4	--	--	--	--
A-15-04 12ABB	74-07-31	--	--	--	--	--	--
	74-08-20	--	--	--	--	--	--
	74-08-27	--	--	--	--	--	--
	74-10-11	--	--	--	--	--	--
	74-11-14	--	--	--	--	--	--
A-15-04 15ACA	77-06-29	--	4	--	--	--	--
A-15-04 15DAC	77-07-27	--	0	--	--	--	--
A-15-04 18ABB	77-08-17	--	0	--	--	--	--
A-15-04 19AAA	77-08-02	--	0	--	--	--	--
A-15-04 22BCC	77-07-27	--	20	--	--	--	--
A-15-04 33DCB	58-12-09	--	--	--	--	--	--
	77-06-09	--	0	--	--	--	--
A-15-05 11AAB	74-06-04	--	--	--	--	--	--

LOCAL IDENT-I-FIER	SITE	GEO-LOGIC UNIT	DATE OF SAMPLE	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG °C)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)
A-15-05 20ABB	GW	121VERD	78-03-23	1028	600	7.3	19.0	240	0	50
	GW	121VERD	79-05-01	80020	580	7.4	--	--	--	--
A-15-05 24DCA	GW	121VERD	78-03-23	1028	675	7.6	19.0	280	0	55
	GW	121VERD	79-06-01	80020	700	--	--	--	--	--
A-15-05 35AAC	GW	121VERD	67-01-10	1028	558	8.2	--	204	0	32
A-15-05 35ACD	GW	121VERD	78-04-19	1028	750	--	22.0	330	0	78
	GW	121VERD	79-05-01	80020	725	7.1	20.0	--	--	--
	GW	121VERD	79-06-01	80020	--	--	--	330	0	80
A-15-05 36ABB	GW	121VERD	79-05-01	80020	800	7.1	20.0	--	--	--
A-15-05 36CCB1	GW	121VERD	78-02-02	1028	790	7.3	20.0	310	0	76
	GW	121VERD	79-05-02	80020	660	--	--	--	--	--
A-15-05 36CCB2	GW	121VERD	75-10-11	9704	579	7.8	--	296	0	83
A-15-05 36CCB3	GW	121VERD	75-10-11	9704	579	7.8	--	296	0	81
A-15-05 36CCC	GW	121VERD	78-02-02	1028	675	7.3	16.0	290	0	71
A-15-05 36DBB	GW	121VERD	78-01-24	1028	950	7.3	20.5	350	0	85
A-15-06 29CAA	GW	310SUPI	78-04-20	1028	600	--	21.0	280	0	62
A-15-06 31CBA1	GW	121VERD	64-04-12	1028	912	7.4	20.0	385	0	95
	GW	121VERD	68-08-29	1028	812	7.7	--	318	0	63
A-15-06 31CBA2	GW	121VERD	78-02-09	1028	900	7.2	18.5	400	0	93
A-15-06 31DBA	SP	121VERD	40-07-31	9802	--	--	--	430	0	112
	SP	121VERD	49-07-26	1028	983	--	--	440	0	114
	SP	121VERD	56-06-22	1028	994	7.0	24.5	450	0	116
	SP	121VERD	57-05-29	1028	991	7.2	24.5	450	0	--
	SP	121VERD	58-07-23	1028	973	7.4	24.0	438	0	--
	SP	121VERD	59-07-14	1028	970	6.9	25.0	446	0	117
	SP	121VERD	64-04-12	1028	969	7.1	22.0	435	0	121
	SP	121VERD	73-08-08	1028	615	8.0	25.0	270	0	49
	SP	121VERD	76-01-22	1028	910	--	20.0	410	0	110
	SP	121VERD	79-05-01	80020	925	6.9	21.0	--	--	--
A-15-06 32CBD	SP	121VERD	40-07-31	9802	--	--	--	540	0	145
	SP	121VERD	49-07-25	1028	1240	--	--	567	0	148
	SP	121VERD	59-02-06	1028	1230	6.7	24.0	460	0	94
A-15-06 35CAC	SP	310CCNN	59-07-10	1028	331	8.0	21.0	166	0	32
	SP	310CCNN	78-05-03	1028	450	7.8	21.0	170	2	32
A-15-07 14ACC	SP	310CCNN	59-10-19	1028	256	7.4	15.5	115	0	29
A-16-02 12CAD2	GW	330RDLL	78-02-08	1028	650	7.4	27.0	310	53	77
A-16-02 24AAB	GW	120VLCC	78-02-08	1028	360	8.5	20.5	22	0	5.7
A-16-03 08CDB	GW	121VERD	58-10-09	1028	541	7.5	--	256	3	58
A-16-03 17DBC	GW	121VERD	78-02-08	1028	520	7.5	18.5	250	7	57
A-16-03 21BBB	GW	121VERD	78-02-09	1028	500	7.4	19.0	230	0	49

Table 13.--Chemical analysis of water from selected wells and springs in the upper Verde River area—Continued

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM+POTAS-SIUM DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)
A-15-05 20ABB	78-03-23	28	38	1.1	--	6.8	340	0	10	16
	79-05-01	--	--	--	--	--	--	0	--	--
A-15-05 24DCA	78-03-23	35	44	1.1	--	5.6	390	0	18	22
	79-06-01	--	--	--	--	--	--	--	--	--
A-15-05 35AAC	67-01-10	30	--	--	34	--	290	0	6.0	25
A-15-05 35ACD	78-04-19	32	38	.9	--	3.9	440	--	9.3	28
	79-05-01	--	--	--	--	--	--	0	--	--
	79-06-01	32	40	1.0	44	4.1	--	--	14	28
A-15-05 36ABB	79-05-01	--	--	--	--	--	--	0	--	--
A-15-05 36CCB1	78-02-02	30	33	.8	--	3.7	410	0	15	28
	79-05-02	--	--	--	--	--	--	--	--	--
A-15-05 36CCB2	75-10-11	22	37	.9	--	--	378	0	10	27
A-15-05 36CCB3	75-10-11	16	37	1.0	--	--	388	0	12	25
A-15-05 36CCC	78-02-02	26	32	.8	--	4.7	390	0	11	24
A-15-05 36DBB	78-01-24	34	42	1.0	--	4.2	470	0	13	25
A-15-06 29CAA	78-04-20	31	21	.5	--	6.9	370	--	9.3	13
A-15-06 31CBA1	64-04-12	36	57	1.3	--	6.0	539	0	14	41
	68-08-29	39	--	--	60	--	476	0	1.0	40
A-15-06 31CBA2	78-02-09	40	54	1.2	--	5.2	550	0	14	41
A-15-06 31DBA	40-07-31	36	53	1.1	--	2.0	601	--	10	35
	49-07-26	38	--	--	56	--	602	--	15	37
	56-06-22	39	--	1.1	--	--	602	0	17	37
	57-05-29	--	--	--	--	--	629	0	--	38
	58-07-23	--	--	--	--	--	600	0	--	39
	59-07-14	37	--	1.0	49	--	598	0	10	35
	64-04-12	32	53	1.1	--	5.4	599	0	12	37
	73-06-08	35	55	1.5	--	2.7	390	0	12	37
	76-01-22	33	51	1.1	--	5.7	603	--	13	37
	79-05-01	--	--	--	--	--	--	0	--	--
A-15-06 32CBD	40-07-31	47	70	1.3	--	5.0	775	--	14	46
	49-07-25	48	--	--	70	--	774	--	16	49
	59-02-06	55	--	2.4	116	--	765	0	16	48
A-15-06 35CAC	59-07-10	21	--	.4	11	--	212	0	5.4	7.0
	78-05-03	23	6.7	.2	--	2.0	210	0	2.6	3.9
A-15-07 14ACC	59-10-19	10	--	.2	4.8	--	147	0	.2	2.5
A-16-02 12CAD2	78-02-08	26	26	.6	--	1.6	310	0	57	22
A-16-02 24AAB	78-02-08	2.0	78	7.2	--	2.1	170	2	32	16
A-16-03 08CDB	58-10-09	27	--	.4	16	--	308	0	6.4	22
A-16-03 17DBC	78-02-08	27	14	.4	--	2.1	300	0	6.9	19
A-16-03 21BBB	78-02-09	26	23	.7	--	2.1	300	0	10	16

LOCAL IDENT-I-FIER	DATE OF SAMPLE	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
A-15-05 20ABB	78-03-23	.3	60	--	385	.52	--	1.7	.09	.28
	79-05-01	--	--	--	--	--	--	--	--	--
A-15-05 24DCA	78-03-23	.3	35	--	417	.57	--	2.1	.00	.00
	79-06-01	--	--	--	--	--	--	--	--	--
A-15-05 35AAC	67-01-10	.1	24	--	--	--	--	--	--	--
A-15-05 35ACD	78-04-19	.3	22	--	430	.58	--	.20	.00	.00
	79-05-01	--	--	--	--	--	--	--	--	--
	79-06-01	.3	23	--	445	.61	--	--	--	--
A-15-05 36ABB	79-05-01	--	--	--	--	--	--	--	--	--
A-15-05 36CCB1	78-02-02	.4	24	--	414	.56	--	.24	.01	.03
	79-05-02	--	--	--	--	--	--	--	--	--
A-15-05 36CCB2	75-10-11	.5	--	--	419	--	--	--	--	--
A-15-05 36CCB3	75-10-11	.4	--	--	424	--	--	--	--	--
A-15-05 36CCC	78-02-02	.5	20	--	384	.52	--	.02	.01	.03
A-15-05 36DBB	78-01-24	.3	25	--	462	.63	--	.15	.02	.06
A-15-06 29CAA	78-04-20	.6	12	--	340	.46	--	.28	.01	.03
A-15-06 31CBA1	64-04-12	.3	18	526	534	.72	--	--	--	--
	68-08-29	.3	23	--	460	--	--	--	--	--
A-15-06 31CBA2	78-02-09	.2	24	--	545	.74	--	.35	.06	.18
A-15-06 31DBA	40-07-31	--	--	--	552	--	.23	--	--	--
	49-07-26	.0	18	--	575	.78	.11	--	--	--
	56-06-22	.6	42	--	603	.82	--	--	--	--
	57-05-29	--	--	--	--	--	--	--	--	--
	58-07-23	--	--	--	--	--	--	--	--	--
	59-07-14	.4	22	--	565	.77	.18	--	--	--
	64-04-12	.3	16	564	573	.77	--	--	--	--
	73-08-08	.2	16	--	400	.54	.02	.03	.05	.15
	76-01-22	.2	15	494	563	.67	--	.03	.01	.03
	79-05-01	--	--	--	--	--	--	--	--	--
A-15-06 32CBD	40-07-31	--	--	--	715	--	.23	--	--	--
	49-07-25	.0	17	--	730	.99	.16	--	--	--
	59-02-06	.2	19	--	725	.99	--	--	--	--
A-15-06 35CAC	59-07-10	.1	24	--	206	--	--	--	--	--
	78-05-03	.1	20	--	195	.27	--	.26	.01	.03
A-15-07 14ACC	59-10-19	.2	23	--	143	.19	.25	--	--	--
A-16-02 12CAD2	78-02-08	.1	22	--	396	.54	--	--	.02	.06
A-16-02 24AAB	78-02-08	.4	16	--	239	.33	--	.03	.02	.06
A-16-03 08CDB	58-10-09	.2	22	--	303	--	--	--	--	--
A-16-03 17DBC	78-02-08	.1	16	--	291	.40	--	.21	.01	.03
A-16-03 21BBB	78-02-09	.2	21	--	297	.40	--	.25	.02	.06

Table 13.--Chemical analysis of water from selected wells and springs in the upper Verde River area—Continued

LOCAL IDENT- I- FIER	DATE OF SAMPLE	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS- SOLVED (UG/L AS AS)	BORON, DIS- SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)
A-15-05 20ABB	78-03-23	--	18	150	--	--	--	--	0	--
	79-05-01	16	--	--	--	--	--	--	--	--
A-15-05 24DCA	78-03-23	--	2	170	--	--	--	--	10	--
	79-06-01	2	--	--	1	10	10	10	--	27
A-15-05 35AAC	67-01-10	--	--	--	--	--	--	--	0	--
A-15-05 35ACD	78-04-19	--	130	500	--	--	--	--	20	--
	79-05-01	37	--	--	--	--	--	--	--	--
	79-06-01	--	38	640	--	--	--	--	10	--
A-15-05 36ABB	79-05-01	37	35	--	1	10	8	30	--	41
A-15-05 36CCB1	78-02-02	--	36	420	--	--	--	--	20	--
	79-05-02	51	--	--	--	--	--	--	--	--
A-15-05 36CCB2	75-10-11	50	--	--	<10	<10	<50	--	--	<50
A-15-05 36CCB3	75-10-11	50	--	--	<10	<10	--	<50	--	<50
A-15-05 36CCC	78-02-02	--	1	350	--	--	--	--	10	--
A-15-05 36DBB	78-01-24	--	10	580	--	--	--	--	30	--
A-15-06 29CAA	78-04-20	--	35	470	--	--	--	--	50	--
A-15-06 31CBA1	64-04-12	--	--	620	--	--	--	20	--	--
	68-08-29	--	--	--	--	--	--	--	20	--
A-15-06 31CBA2	78-02-09	--	29	730	--	--	--	--	60	--
A-15-06 31DBA	40-07-31	--	--	--	--	--	--	--	--	--
	49-07-26	--	--	--	--	--	--	--	--	--
	56-06-22	--	--	2000	--	--	--	0	--	--
	57-05-29	--	--	--	--	--	--	--	--	--
	58-07-23	--	--	--	--	--	--	--	--	--
	59-07-14	--	--	--	--	--	--	--	--	--
	64-04-12	--	--	610	--	--	--	20	--	--
	73-06-08	--	--	730	--	--	--	--	30	--
	76-01-22	--	--	690	--	--	--	--	10	--
	79-05-01	100	--	--	--	--	--	--	--	--
A-15-06 32CBD	40-07-31	--	--	--	--	--	--	--	--	--
	49-07-25	--	--	--	--	--	--	--	--	--
	59-02-06	--	--	--	--	--	--	--	--	--
A-15-06 35CAC	59-07-10	--	--	--	--	--	--	--	--	--
	78-05-03	--	--	10	--	--	--	--	10	--
A-15-07 14ACC	59-10-19	--	--	--	--	--	--	--	--	--
A-16-02 12CAD2	78-02-08	--	7	150	--	--	--	--	20	--
A-16-02 24AAB	78-02-08	--	50	170	--	--	--	--	70	--
A-16-03 08CDB	58-10-09	--	--	--	--	--	--	--	--	--
A-16-03 17DBC	78-02-08	--	8	50	--	--	--	--	10	--
A-16-03 21BBB	78-02-09	--	14	150	--	--	--	--	10	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	SELE-NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)
A-15-05 20ABB	78-03-23	--	0	--	--	--	--
	79-05-01	--	--	--	--	--	--
A-15-05 24DCA	78-03-23	--	0	--	--	--	--
	79-06-01	0	--	.0	21	0	420
A-15-05 35AAC	67-01-10	--	--	--	--	--	--
A-15-05 35ACD	78-04-19	--	0	--	--	--	--
	79-05-01	--	--	--	--	--	--
	79-06-01	--	--	--	--	--	--
A-15-05 36ABB	79-05-01	10	--	.1	1	0	80
A-15-05 36CCB1	78-02-02	--	0	--	--	--	--
	79-05-02	--	--	--	--	--	--
A-15-05 36CCB2	75-10-11	--	--	<.5	<10	<10	<50
A-15-05 36CCB3	75-10-11	--	--	<.5	<10	<10	<60
A-15-05 36CCC	78-02-02	--	60	--	--	--	--
A-15-05 36DBB	78-01-24	--	0	--	--	--	--
A-15-06 29CAA	78-04-20	--	0	--	--	--	--
A-15-06 31CBA1	64-04-12	--	--	--	--	--	--
	68-08-29	--	--	--	--	--	--
A-15-06 31CBA2	78-02-09	--	0	--	--	--	--
A-15-06 31DBA	40-07-31	--	--	--	--	--	--
	49-07-26	--	--	--	--	--	--
	56-06-22	--	--	--	--	--	--
	57-05-29	--	--	--	--	--	--
	58-07-23	--	--	--	--	--	--
	59-07-14	--	--	--	--	--	--
	64-04-12	--	--	--	--	--	--
	73-06-08	--	10	--	--	--	--
	76-01-22	--	--	--	--	--	--
	79-05-01	--	--	--	--	--	--
A-15-06 32CBD	40-07-31	--	--	--	--	--	--
	49-07-25	--	--	--	--	--	--
	59-02-06	--	--	--	--	--	--
A-15-06 35CAC	59-07-10	--	--	--	--	--	--
	78-05-03	--	0	.0	--	--	--
A-15-07 14ACC	59-10-19	--	--	--	--	--	--
A-16-02 12CAD2	78-02-08	--	0	.1	--	--	--
A-16-02 24AAB	78-02-08	--	0	--	--	--	--
A-16-03 08CDB	58-10-09	--	--	--	--	--	--
A-16-03 17DBC	78-02-08	--	10	.0	--	--	--
A-16-03 21BBB	78-02-09	--	0	--	--	--	--

LOCAL IDENT-I-FIER	SITE	GEO-LOGIC UNIT	DATE OF SAMPLE	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG °C)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)
A-16-03 21CBB	SP	121VERD	58-10-29	1028	1620	7.3	19.5	930	703	212
A-16-03 22BCC	GW	121VERD	59-08-18	1028	464	7.4	--	213	0	42
	GW	121VERD	63-05-04	1028	469	7.7	14.5	212	0	39
	GW	121VERD	64-04-20	1028	467	7.7	--	213	0	37
	GW	121VERD	75-06-11	9704	459	--	--	111	0	24
A-16-03 27BAD	GW	121VERD	58-10-15	1028	539	7.3	21.0	245	5	57
A-16-03 27DAB	GW	121VERD	58-10-09	1028	558	7.5	--	264	7	60
	GW	121VERD	73-07-30	9704	454	7.5	--	260	16	67
	GW	121VERD	76-11-30	9704	526	7.6	--	260	22	78
	GW	121VERD	78-02-09	1028	520	7.2	--	270	16	62
A-16-03 28DDB	GW	121VERD	73-02-13	9704	476	8.2	--	256	16	64
A-16-03 28DDD	GW	121VERD	73-02-13	9704	667	7.9	--	372	14	92
A-16-03 29AAD1	GW	121VERD	78-02-08	1028	460	7.8	--	110	0	21
A-16-03 30ABD	GW	--	58-10-09	1028	595	7.6	--	273	112	27
A-16-03 31DCA	SP	330RDLL	58-10-24	1028	709	7.6	18.0	336	95	72
	SP	330RDLL	73-03-19	9704	714	7.7	--	340	160	100
	SP	330RDLL	74-07-26	9704	571	--	--	340	160	100
A-16-03 31DCA	GW	330RDLL	77-07-08	9704	625	7.4	--	350	40	76
A-16-03 31DDC1	GW	--	77-12-20	1028	625	7.2	22.0	320	90	67
A-16-03 33DCD	GW	121VERD	78-02-24	1028	--	--	--	260	14	43
A-16-03 33DDD	GW	121VERD	78-02-24	1028	560	7.6	--	300	26	66
A-16-03 34AAD	GW	121VERD	73-02-13	9704	454	8.3	--	250	21	58
A-16-03 34ADC	GW	121VERD	73-02-03	9704	454	8.3	--	250	16	58
A-16-03 34CCD1	GW	121VERD	73-02-13	9704	500	8.2	--	274	30	70
A-16-03 34CCD2	GW	121VERD	73-02-13	9704	435	8.0	--	260	32	42
A-16-03 34CDC	GW	121VERD	77-04-14	1028	650	6.9	25.0	290	0	55
A-16-03 35DAB3	GW	121VERD	77-09-01	1028	500	7.3	20.5	260	11	50
A-16-03 35DDC	GW	121VERD	58-10-07	1028	543	7.3	--	254	6	54
A-16-04 12BAA1	GW	310SUPI	68-07-01	9704	413	--	--	210	37	47
A-16-04 14CBD	GW	310SUPI	58-10-14	1028	533	7.3	20.0	242	11	59
	GW	310SUPI	74-06-24	--	500	--	20.0	--	--	--
A-16-04 15CCC	SP	--	59-02-04	1028	549	7.3	21.0	266	19	55
A-16-04 15DDD	GW	310SUPI	58-10-14	1028	547	7.3	20.5	242	13	59
A-16-04 15DDD1	SP	--	52-02-12	1028	545	--	--	259	24	61
A-16-04 23BBA	SP	310SUPI	52-02-12	1028	404	--	19.0	206	5	48
A-16-04 23BBC	SP	310SUPI	68-05-20	1028	498	7.3	19.5	238	10	54
A-16-04 23BCA	GW	310SUPI	59-06-17	1028	411	7.3	19.0	204	0	57
A-16-04 23CAB	GW	121VERD	74-05-22	--	500	--	--	--	--	--
A-16-04 23CAC	GW	310SUPI	58-10-14	1028	556	7.4	20.5	244	0	60
A-16-04 23DBB	GW	121VERD	74-05-22	--	530	--	--	--	--	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM+POTAS-SIUM DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)
A-16-03 21CBB	58-10-29	96	--	.6	39	--	277	0	673	52
A-16-03 22BCC	59-08-18	26	--	.6	19	--	263	0	8.2	19
	63-03-04	28	19	.6	--	2.8	271	0	7.2	20
	64-04-20	29	19	.6	--	2.9	270	0	6.6	19
	75-08-11	12	74	3.1	--	--	263	--	8.0	20
A-16-03 27BAD	58-10-15	25	--	.5	20	--	293	0	6.0	29
A-16-03 27DAB	58-10-09	28	--	.5	20	--	314	0	5.6	30
	73-07-30	22	15	.4	--	--	297	0	13	26
	76-11-30	16	18	.5	--	--	290	0	6.0	29
	78-02-09	26	15	.4	--	1.8	310	0	85	25
A-16-03 28DDB	73-02-13	23	14	.4	--	--	293	0	<1.0	26
A-16-03 28DDD	73-02-13	34	18	.4	--	--	437	0	<1.0	26
A-16-03 29AAD1	78-02-08	15	61	2.5	--	3.7	290	0	9.7	4.5
A-16-03 30ABD	58-10-09	50	--	.5	21	--	197	0	112	24
A-16-03 31DCA	58-10-24	36	--	.6	23	--	294	0	95	28
	73-03-19	19	12	.3	--	--	220	0	90	16
	74-07-26	21	14	.3	--	--	220	--	100	26
A-16-03 31DCA	77-07-08	58	14	.3	--	--	378	0	96	26
A-16-03 31DDC1	77-12-20	37	13	.3	--	1.3	280	0	77	21
A-16-03 33DCD	78-02-24	37	15	.4	--	2.0	300	--	--	--
A-16-03 33DDD	78-02-24	32	16	.4	--	2.1	330	0	--	--
A-16-03 34AAD	73-02-13	25	14	.4	--	--	279	0	<1.0	27
A-16-03 34ADC	73-02-03	25	14	.4	--	--	285	0	<1.0	27
A-16-03 34CCD1	73-02-13	24	15	.4	--	--	297	0	8.0	25
A-16-03 34CCD2	73-02-13	37	13	.4	--	--	278	0	11	18
A-16-03 34CDC	77-04-14	37	22	.6	--	2.9	360	0	16	23
A-16-03 35DAB3	77-09-01	32	15	.4	--	1.9	300	0	9.3	20
A-16-03 35DDC	58-10-07	29	--	.5	20	--	302	0	5.2	30
A-16-04 12BAA1	68-07-01	22	5.0	.2	--	--	257	--	<5.0	3.0
A-16-04 14CBD	58-10-14	23	--	.6	20	--	281	0	5.8	34
	74-06-24	--	--	--	--	--	--	--	--	--
A-16-04 15CCC	59-02-04	32	--	.4	16	--	304	0	7.0	32
A-16-04 15DDD	58-10-14	23	--	.6	21	--	279	0	6.0	36
A-16-04 15DDD1	52-02-12	26	--	--	16	--	287	--	6.4	36
A-16-04 23BBA	52-02-12	21	--	--	6.2	--	246	--	3.9	10
A-16-04 23BBC	68-05-20	25	16	.5	--	1.0	279	0	5.0	22
A-16-04 23BCA	59-08-17	15	--	.3	9.9	--	250	0	5.1	9.2
A-16-04 23CAB	74-05-22	--	--	--	--	--	--	--	--	--
A-16-04 23CAC	58-10-14	23	--	.7	24	--	299	0	5.2	32
A-16-04 23DBB	74-05-22	--	--	--	--	--	--	--	--	--

Table 13.--Chemical analysis of water from selected wells and springs in the upper Verde River area—Continued

LOCAL IDENT-I-FIER	DATE OF SAMPLE	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
A-16-03 21CBB	58-10-29	.2	36	--	1260	1.71	3.6	--	--	--
A-16-03 22BCC	59-08-18	.5	41	--	266	.39	--	--	--	--
	63-03-04	.3	27	270	277	.37	--	--	--	--
	64-04-20	.3	31	274	279	.37	--	--	--	--
	75-08-11	.4	--	346	--	--	--	--	--	--
A-16-03 27BAD	58-10-15	.2	22	--	304	--	--	--	--	--
A-16-03 27DAB	58-10-09	.1	22	--	320	--	--	--	--	--
	73-07-30	.1	--	290	--	--	--	--	--	--
	76-11-30	.2	--	305	--	--	--	--	--	--
	78-02-09	.1	18	--	313	.43	--	.30	.01	.03
A-16-03 28DDB	73-02-13	.1	--	--	308	--	--	--	--	--
A-16-03 28DDD	73-02-13	--	--	--	425	--	--	--	--	--
A-16-03 29AAD1	78-02-08	.6	19	--	280	.38	--	.44	.01	.03
A-16-03 30ABD	58-10-09	.2	32	--	370	--	--	--	--	--
A-16-03 31DCA	58-10-24	.2	32	--	441	--	1.8	--	--	--
	73-03-19	.2	--	--	354	--	.90	--	--	--
	74-07-26	.2	--	--	370	--	1.4	--	--	--
A-16-03 31DCA	77-07-08	.2	--	422	--	--	--	--	--	--
A-16-03 31DDC1	77-12-20	.2	22	--	363	.52	--	1.5	.01	.03
A-16-03 33DCD	78-02-24	--	--	--	--	--	--	.42	.01	.03
A-16-03 33DDD	78-02-24	--	--	--	--	--	--	.33	.01	.03
A-16-03 34AAD	73-02-13	.2	--	--	290	--	--	--	--	--
A-16-03 34ADC	73-02-03	.2	--	--	290	--	--	--	--	--
A-16-03 34CCD1	73-02-13	.2	--	--	325	--	--	--	--	--
A-16-03 34CCD2	73-02-13	.3	--	--	278	--	--	--	--	--
A-16-03 34CDC	77-04-14	.2	43	--	379	.52	--	.46	.05	.15
A-16-03 35DAB3	77-09-01	.2	23	--	301	.41	--	.27	.03	.09
A-16-03 35DDC	58-10-07	.2	24	--	312	--	--	--	--	--
A-16-04 12BAA1	68-07-01	.1	--	--	260	--	.23	--	--	--
A-16-04 14CBD	58-10-14	.1	17	--	298	--	.23	--	--	--
	74-06-24	--	--	--	--	--	--	--	--	--
A-16-04 15CCC	59-02-04	.2	18	--	310	.42	--	--	--	--
A-16-04 15DDD	58-10-14	.1	14	--	297	--	.18	--	--	--
A-16-04 15DDD1	52-02-12	.0	15	--	303	--	.32	--	--	--
A-16-04 23BBA	52-02-12	.0	18	--	229	.31	.18	--	--	--
A-16-04 23BBC	68-05-20	.2	21	--	281	--	--	--	--	--
A-16-04 23BCA	59-08-17	.3	20	--	241	.33	.25	--	--	--
A-16-04 23CAB	74-05-22	--	--	--	--	--	--	--	--	--
A-16-04 23CAC	58-10-14	.1	18	--	310	--	.23	--	--	--
A-16-04 23DBB	74-05-22	--	--	--	--	--	--	--	--	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
A-16-03 21CBB	58-10-29	--	--	--	--	--	--	--	--	--
A-16-03 22BCC	59-08-18	--	--	--	--	--	--	--	--	--
	63-03-04	--	--	70	--	--	--	20	--	--
	64-04-20	--	--	60	--	--	--	10	--	--
	75-08-11	30	--	--	--	--	--	100	--	--
A-16-03 27BAD	58-10-15	--	--	--	--	--	--	--	--	--
A-16-03 27DAB	58-10-09	--	--	--	--	--	--	--	--	--
	73-07-30	<10	--	--	--	--	--	<50	--	--
	76-11-30	17	--	--	--	--	--	70	--	--
	78-02-09	--	23	70	--	--	--	--	20	--
A-16-03 28DDB	73-02-13	10	--	--	<10	<10	<50	<50	--	<50
A-16-03 28DDD	73-02-13	10	--	--	<10	<10	<50	50	--	<50
A-16-03 29AAD1	78-02-08	--	20	110	--	--	--	--	20	--
A-16-03 30ABD	58-10-09	--	--	--	--	--	--	--	--	--
A-16-03 31DCA	58-10-24	--	--	--	--	--	--	--	--	--
	73-03-19	<10	--	--	<10	<10	<50	<50	--	<50
	74-07-26	<10	--	--	<10	<10	<50	50	--	<50
A-16-03 31DCA	77-07-08	<5	--	--	--	--	--	<50	--	--
A-16-03 31DDC1	77-12-20	--	4	40	--	--	--	--	10	--
A-16-03 33DCD	78-02-24	--	13	--	--	--	--	--	30	--
A-16-03 33DDD	78-02-24	--	14	--	--	--	--	--	10	--
A-16-03 34AAD	73-02-13	20	--	--	<10	<10	<50	<50	--	<50
A-16-03 34ADC	73-02-03	20	--	--	<10	<10	<50	<50	--	<50
A-16-03 34CCD1	73-02-13	<10	--	--	<10	<10	<50	<50	--	<50
A-16-03 34CCD2	73-02-13	10	--	--	<50	<10	<50	<50	--	<50
A-16-03 34CDC	77-04-14	--	--	50	--	--	--	--	90	--
A-16-03 35DAB3	77-09-01	--	17	40	--	--	--	--	40	--
A-16-03 35DDC	58-10-07	--	--	--	--	--	--	--	--	--
A-16-04 12BAA1	68-07-01	--	--	--	--	--	--	--	--	--
A-16-04 14CBD	58-10-14	--	--	--	--	--	--	--	--	--
	74-06-24	--	--	--	--	--	--	--	--	--
A-16-04 15CCC	59-02-04	--	--	--	--	--	--	--	--	--
A-16-04 15DDD	58-10-14	--	--	--	--	--	--	--	--	--
A-16-04 15DDD1	52-02-12	--	--	--	--	--	--	--	--	--
A-16-04 23BBA	52-02-12	--	--	--	--	--	--	--	--	--
A-16-04 23BBC	68-05-20	--	--	--	--	--	--	--	--	--
A-16-04 23BCA	59-08-17	--	--	--	--	--	--	--	--	--
A-16-04 23CAB	74-05-22	--	--	--	--	--	--	--	--	--
A-16-04 23CAC	58-10-14	--	--	--	--	--	--	--	--	--
A-16-04 23DBB	74-05-22	--	--	--	--	--	--	--	--	--

Table 13.--Chemical analysis of water from selected wells and springs in the upper Verde River area—Continued

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	SELE-NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)
A-16-03 21CBB	58-10-29	--	--	--	--	--	--
A-16-03 22BCC	59-08-18	--	--	--	--	--	--
	63-03-04	--	--	--	--	--	--
	64-04-20	--	--	--	--	--	--
	75-08-11	<50	--	--	--	--	190
A-16-03 27BAD	58-10-15	--	--	--	--	--	--
A-16-03 27DAB	58-10-09	--	--	--	--	--	--
	73-07-30	<50	--	--	--	--	--
	76-11-30	<50	--	--	--	--	--
	78-02-09	--	0	--	--	--	--
A-16-03 28DDB	73-02-13	--	--	<.5	<10	<10	<50
A-16-03 28DDD	73-02-13	--	--	<.5	<10	<10	<50
A-16-03 29AAD1	78-02-08	--	0	--	--	--	--
A-16-03 30ABD	58-10-09	--	--	--	--	--	--
A-16-03 31DCA	58-10-24	--	--	--	--	--	--
	73-03-19	<50	--	<.5	<10	<10	<50
	74-07-26	<50	--	<.5	<10	<10	200
A-16-03 31DCA	77-07-08	<50	--	--	--	--	--
A-16-03 31DDC1	77-12-20	--	20	--	--	--	--
A-16-03 33DCD	78-02-24	--	10	--	--	--	--
A-16-03 33DDD	78-02-24	--	0	--	--	--	--
A-16-03 34AAD	73-02-13	<50	--	<.5	<10	<10	<90
A-16-03 34ADC	73-02-03	--	--	<.5	<10	<10	90
A-16-03 34CCD1	73-02-13	<50	--	<.5	<10	<10	<50
A-16-03 34CCD2	73-02-13	<50	--	.5	<10	<10	<50
A-16-03 34CDC	77-04-14	--	0	--	--	--	--
A-16-03 35DAB3	77-09-01	--	10	--	--	--	--
A-16-03 35DDC	58-10-07	--	--	--	--	--	--
A-16-04 12BAA1	68-07-01	--	--	--	--	--	--
A-16-04 14CBD	58-10-14	--	--	--	--	--	--
	74-06-24	--	--	--	--	--	--
A-16-04 15CCC	59-02-04	--	--	--	--	--	--
A-16-04 15DDD	58-10-14	--	--	--	--	--	--
A-16-04 15DDD1	52-02-12	--	--	--	--	--	--
A-16-04 23BBA	52-02-12	--	--	--	--	--	--
A-16-04 23BBC	68-05-20	--	--	--	--	--	--
A-16-04 23BCA	59-06-17	--	--	--	--	--	--
A-16-04 23CAB	74-05-22	--	--	--	--	--	--
A-16-04 23CAC	58-10-14	--	--	--	--	--	--
A-16-04 23DBB	74-05-22	--	--	--	--	--	--

LOCAL IDENT-I-FIER	SITE	GEO-LOGIC UNIT	DATE OF SAMPLE	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG °C)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)
A-16-04 23DDC	SP	121VERD	43-02-07	1028	351	--	20.0	179	0	42
	SP	121VERD	49-08-04	1028	364	--	20.0	183	0	42
	SP	121VERD	68-05-20	1028	374	7.1	20.0	180	0	42
	SP	121VERD	75-01-20	1028	364	7.7	20.0	170	0	41
A-16-04 26DAC	GW	--	58-10-15	1028	837	7.5	17.0	411	0	84
A-16-04 26DCC	GW	310SUPI	59-02-04	1028	558	7.8	21.5	278	18	44
A-16-04 26DDC	GW	--	74-05-22	--	580	--	17.0	--	--	--
A-16-04 27DCC	GW	121VERD	72-07-20	9704	500	7.8	--	266	49	70
	GW	121VERD	74-05-21	--	480	--	--	--	--	--
A-16-04 33BAB	SP	--	52-07-09	1028	595	--	21.5	294	14	70
A-16-04 34ABB	GW	121VERD	79-03-21	9801	--	7.9	--	244	--	--
A-16-04 34BBB	SP	--	52-07-09	1028	641	--	--	326	26	78
A-16-04 34BCA	GW	111ALVM	74-05-17	--	500	--	--	--	--	--
A-16-04 34BCB	GW	121VERD	74-05-21	--	600	--	--	--	--	--
A-16-04 34BCD	GW	111ALVM	74-05-17	--	550	--	--	--	--	--
A-16-04 34BDA	GW	--	74-05-17	--	550	--	18.0	--	--	--
A-16-04 34BDC	GW	121VERD	74-05-17	--	490	--	18.0	--	--	--
A-16-04 34BDD	GW	121VERD	74-05-17	--	560	--	--	--	--	--
A-16-04 35BAD	GW	121VERD	74-05-21	--	700	--	--	--	--	--
A-16-04 35BCC	GW	121VERD	74-02-15	--	1010	--	--	--	--	--
A-16-04 35CAB	GW	121VERD	74-06-17	--	900	--	--	--	--	--
A-16-04 35CCA1	GW	121VERD	74-05-21	--	960	--	--	--	--	--
A-16-04 35CCD	GW	121VERD	74-05-21	1028	950	6.9	20.0	610	0	150
A-16-04 35CDC	GW	121VERD	74-05-21	--	890	--	--	--	--	--
A-16-04 35DCB	GW	121VERD	74-05-22	1028	1520	6.8	26.5	660	0	160
A-16-05 11ACC	GW	330RDLL	72-04-25	9704	--	--	--	140	0	30
	GW	330RDLL	74-04-18	1028	309	7.9	18.5	140	0	32
A-16-05 13BBD	GW	310SUPI	73-04-11	9704	286	8.2	--	170	39	38
A-16-05 13BDC	GW	310SUPI	73-04-11	9704	300	8.5	--	176	38	52
A-16-05 14DAD	GW	310SUPI	77-09-08	1028	290	7.4	20.0	130	0	32
A-16-05 14DBA	GW	310SUPI	57-05-23	1028	310	7.4	15.5	148	0	33
	GW	310SUPI	74-04-26	--	350	--	19.0	--	--	--
A-16-05 14DDD	GW	310SUPI	74-06-09	--	260	--	20.5	--	--	--
A-16-05 24ACD	GW	310SUPI	64-08-07	9704	--	--	--	108	--	23
	GW	310SUPI	67-01-16	1028	259	7.0	--	112	0	27
	GW	310SUPI	72-04-27	9704	196	8.2	--	114	24	26
A-16-06 08CCC	GW	310SUPI	57-05-23	1028	422	7.3	16.5	200	8	47
A-16-06 08CCD	GW	310SUPI	67-01-16	1028	368	7.0	--	188	0	49
	GW	310SUPI	72-04-27	9704	330	8.1	--	196	45	50
A-16-06 08CDC	GW	310SUPI	74-04-10	--	360	--	16.0	--	--	--

Table 13.--Chemical analysis of water from selected wells and springs in the upper Verde River area—Continued

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM+ POTAS-SIUM DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)
A-16-04 23DDC	43-02-07	18	--	--	14	--	236	--	--	8.0
	49-08-04	19	--	--	8.7	--	227	--	3.7	8.0
	68-05-20	18	--	--	10	--	229	0	3.0	8.5
	75-01-20	17	8.8	.3	--	1.6	223	0	4.0	8.3
A-16-04 26DAC	58-10-15	49	--	.6	29	--	528	0	5.0	24
A-16-04 26DCC	59-02-04	41	--	.4	15	--	317	0	6.4	30
A-16-04 26DDC	74-05-22	--	--	--	--	--	--	--	--	--
A-16-04 27DCC	72-07-20	22	14	.4	--	--	322	0	11	29
	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 33BAB	52-07-09	29	--	--	17	--	341	--	5.6	31
A-16-04 34ABB	79-03-21	--	--	--	--	--	--	0	30	36
A-16-04 34BBB	52-07-09	32	--	--	13	--	366	--	6.6	34
A-16-04 34BCA	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 34BCB	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 34BCD	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 34BDA	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 34BDC	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 34BDD	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 35BAD	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 35BCC	74-02-15	--	--	--	--	--	--	--	--	--
A-16-04 35CAB	74-06-17	--	--	--	--	--	--	--	--	--
A-16-04 35CCA1	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 35CCD	74-05-21	58	79	1.4	--	7.5	830	0	32	68
A-16-04 35CDC	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 35DCB	74-05-22	63	91	1.5	--	9.0	868	0	40	73
A-16-05 11ACC	72-04-25	16	8.0	.3	--	--	168	--	20	2.0
	74-04-18	14	9.5	.4	--	1.5	169	0	3.7	5.3
A-16-05 13BBD	73-04-11	18	10	.3	--	--	195	0	6.0	6.0
A-16-05 13BDC	73-04-11	11	10	.3	--	--	200	2	6.0	8.0
A-16-05 14DAD	77-09-08	13	8.3	.3	--	1.4	160	0	4.6	5.4
A-16-05 14DBA	57-05-23	16	--	.6	16	--	201	0	5.4	8.5
	74-04-26	--	--	--	--	--	--	--	--	--
A-16-05 14DDD	74-08-09	--	--	--	--	--	--	--	--	--
A-16-05 24ACD	64-08-07	12	9.0	.4	--	--	--	--	6.0	4.0
	67-01-16	11	--	--	18	--	158	0	10	7.5
	72-04-27	12	6.0	.2	--	--	134	0	<6.0	4.0
A-16-06 08CCC	57-05-23	20	--	.2	5.5	--	233	0	6.2	9.0
A-16-06 08CCD	67-01-16	16	--	--	17	--	246	0	8.0	11
	72-04-27	17	10	.3	--	--	227	0	6.0	8.0
A-16-06 08CDC	74-04-10	--	--	--	--	--	--	--	--	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	FLUO-RIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
A-16-04 23DDC	43-02-07	--	16	200	219	.30	.20	--	--	--
	49-08-04	.0	18	--	212	.29	.18	--	--	--
	68-05-20	.2	19	--	214	--	--	--	--	--
	75-01-20	.4	17	191	209	.26	.23	.23	.02	.06
A-16-04 26DAC	58-10-15	.2	42	--	494	--	.23	--	--	--
A-16-04 26DCC	59-02-04	.2	18	--	312	.42	.20	--	--	--
A-16-04 26DDC	74-05-22	--	--	--	--	--	--	--	--	--
A-16-04 27DCC	72-07-20	.2	--	--	325	--	--	--	--	--
	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 33BAB	52-07-09	.2	17	--	339	.46	.18	--	--	--
A-16-04 34ABB	79-03-21	--	--	388	519	--	--	--	--	--
A-16-04 34BBB	52-07-09	.0	17	--	361	--	.05	--	--	--
A-16-04 34BCA	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 34BCB	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 34BCD	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 34BDA	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 34BDC	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 34BDD	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 35BAD	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 35BCC	74-02-15	--	--	--	--	--	--	--	--	--
A-16-04 35CAB	74-06-17	--	--	--	--	--	--	--	--	--
A-16-04 35CCA1	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 35CCD	74-05-21	.4	15	802	821	1.09	--	.16	.03	.09
A-16-04 35CDC	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 35DCB	74-05-22	.4	15	859	891	1.17	--	.21	.02	.06
A-16-05 11ACC	72-04-25	.1	--	--	250	--	--	--	--	--
	74-04-18	.6	19	161	160	.22	.16	.16	.03	.09
A-16-05 13BBD	73-04-11	.1	--	--	150	--	--	--	--	--
A-16-05 13BDC	73-04-11	.2	--	--	190	--	.23	--	--	--
A-16-05 14DAD	77-09-08	.3	18	--	173	.24	--	.24	.04	.12
A-16-05 14DBA	57-05-23	.2	18	--	197	.27	.16	--	--	--
	74-04-26	--	--	--	--	--	--	--	--	--
A-16-05 14DDD	74-08-09	--	--	--	--	--	--	--	--	--
A-16-05 24ACD	64-08-07	<.1	--	--	156	--	--	--	--	--
	67-01-16	.1	19	--	171	--	--	--	--	--
	72-04-27	.1	--	--	134	--	.23	--	--	--
A-16-06 08CCC	57-05-23	.2	17	--	221	.30	.23	--	--	--
A-16-06 08CCD	67-01-16	.1	18	--	240	--	--	--	--	--
	72-04-27	.1	--	--	--	--	.23	--	--	--
A-16-06 08CDC	74-04-10	--	--	--	--	--	--	--	--	--

Table 13.--Chemical analysis of water from selected wells and springs in the upper Verde River area—Continued

LOCAL IDENT-I-FIER	DATE OF SAMPLE	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
A-16-04 23DDC	43-02-07	--	--	--	--	--	--	20	--	--
	49-08-04	--	--	--	--	--	--	--	--	--
	68-05-20	--	--	--	--	--	--	--	--	--
	75-01-20	--	--	50	--	--	--	--	10	--
A-16-04 26DAC	58-10-15	--	--	--	--	--	--	--	--	--
A-16-04 26DCC	59-02-04	--	--	--	--	--	--	--	--	--
A-16-04 26DDC	74-05-22	--	--	--	--	--	--	--	--	--
A-16-04 27DCC	72-07-20	<10	--	--	<10	<10	<50	<50	--	<50
	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 33BAB	52-07-09	--	--	--	--	--	--	--	--	--
A-16-04 34ABB	79-03-21	<20	--	--	<5	<20	<20	<100	--	<20
A-16-04 34BBB	52-07-09	--	--	--	--	--	--	--	--	--
A-16-04 34BCA	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 34BCB	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 34BCD	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 34BDA	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 34BDC	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 34BDD	74-05-17	--	--	--	--	--	--	--	--	--
A-16-04 35BAD	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 35BCC	74-02-15	--	--	--	--	--	--	--	--	--
A-16-04 35CAB	74-06-17	--	--	--	--	--	--	--	--	--
A-16-04 35CCA1	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 35CCD	74-05-21	--	--	650	--	--	--	--	20	--
A-16-04 35CDC	74-05-21	--	--	--	--	--	--	--	--	--
A-16-04 35DCB	74-05-22	--	--	780	--	--	--	--	20	--
A-16-05 11ACC	72-04-25	--	--	--	--	--	--	100	--	--
	74-04-18	--	--	100	--	--	--	--	30	--
A-16-05 13BBD	73-04-11	20	--	--	<10	<10	<50	<50	--	<50
A-16-05 13BDC	73-04-11	20	--	--	<10	<10	<50	50	--	<50
A-16-05 14DAD	77-09-08	--	23	50	--	--	--	--	20	--
A-16-05 14DBA	57-05-23	--	--	--	--	--	--	--	--	--
	74-04-26	--	--	--	--	--	--	--	--	--
A-16-05 14DDD	74-06-09	--	--	--	--	--	--	--	--	--
A-16-05 24ACD	64-06-07	--	--	--	--	<10	<50	<50	--	--
	67-01-16	--	--	--	--	--	--	--	--	--
	72-04-27	30	--	--	<10	<10	<50	<50	--	<50
A-16-06 08CCC	57-05-23	--	--	--	--	--	--	40	20	--
A-16-06 08CCD	67-01-16	--	--	--	--	--	--	--	--	--
	72-04-27	--	--	--	--	--	--	--	--	--
A-16-06 08CDC	74-04-10	--	--	--	--	--	--	--	--	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	SELE-NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)
A-16-04 23DDC	43-02-07	--	--	--	--	--	--
	49-08-04	--	--	--	--	--	--
	68-05-20	--	--	--	--	--	--
	75-01-20	--	--	--	--	--	--
A-16-04 26DAC	58-10-15	--	--	--	--	--	--
A-16-04 26DCC	59-02-04	--	--	--	--	--	--
A-16-04 26DDC	74-05-22	--	--	--	--	--	--
A-16-04 27DCC	72-07-20	<50	--	<.5	<10	<10	--
	74-05-21	--	--	--	--	--	--
A-16-04 33BAB	52-07-09	--	--	--	--	--	--
A-16-04 34ABB	79-03-21	<20	--	<.5	<3	<20	30
A-16-04 34BBB	52-07-09	--	--	--	--	--	--
A-16-04 34BCA	74-05-17	--	--	--	--	--	--
A-16-04 34BCB	74-05-21	--	--	--	--	--	--
A-16-04 34BCD	74-05-17	--	--	--	--	--	--
A-16-04 34BDA	74-05-17	--	--	--	--	--	--
A-16-04 34BDC	74-05-17	--	--	--	--	--	--
A-16-04 34BDD	74-05-17	--	--	--	--	--	--
A-16-04 35BAD	74-05-21	--	--	--	--	--	--
A-16-04 35BCC	74-02-15	--	--	--	--	--	--
A-16-04 35CAB	74-06-17	--	--	--	--	--	--
A-16-04 35CCA1	74-05-21	--	--	--	--	--	--
A-16-04 35CCD	74-05-21	--	--	--	--	--	--
A-16-04 35CDC	74-05-21	--	--	--	--	--	--
A-16-04 35DCB	74-05-22	--	--	--	--	--	--
A-16-05 11ACC	72-04-25	--	--	--	--	--	--
	74-04-18	--	--	--	--	--	--
A-16-05 13BBD	73-04-11	<50	--	<.5	<10	<10	200
A-16-05 13BDC	73-04-11	<50	--	<.5	<10	<10	60
A-16-05 14DAD	77-09-08	--	0	--	--	--	--
A-16-05 14DBA	57-05-23	--	--	--	--	--	--
	74-04-26	--	--	--	--	--	--
A-16-05 14DDD	74-08-09	--	--	--	--	--	--
A-16-05 24ACD	64-08-07	--	--	--	--	--	--
	67-01-16	--	--	--	--	--	--
	72-04-27	<50	--	<.5	<10	<10	100
A-16-06 08CCC	57-05-23	--	--	--	--	--	--
A-16-06 08CCD	67-01-16	--	--	--	--	--	--
	72-04-27	--	--	--	--	--	--
A-16-06 08CDC	74-04-10	--	--	--	--	--	--

Table 13.--Chemical analysis of water from selected wells and springs in the upper Verde River area—Continued

LOCAL IDENT- I- FIER	SITE	GEO- LOGIC UNIT	DATE OF SAMPLE	AGENCY ANA- LYZING SAMPLE (CODE NUMBER)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG °C)	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)
A-16-06 09CCA	GW	310SUPI	72-03-28	9704	588	8.1	--	540	360	66
A-16-06 17BAB	GW	310SUPI	74-04-10	--	350	--	17.5	--	--	--
A-16-06 17CBB2	GW	310SUPI	74-04-17	--	350	--	--	--	--	--
A-16-06 17CBD	GW	310SUPI	74-06-11	1028	258	7.9	19.5	120	0	27
A-16-06 18BBC	GW	310SUPI	73-04-11	9704	322	8.2	--	144	18	40
	GW	310SUPI	74-04-19	--	300	--	17.5	--	--	--
A-16-06 18CDB	GW	310SUPI	72-02-01	9704	316	8.7	--	154	9	39
	GW	310SUPI	73-01-17	9704	370	7.9	--	226	50	54
A-16-06 19BBC	GW	310SUPI	74-04-17	--	280	--	18.5	--	--	--
A-16-06 19BCD	GW	310SUPI	72-04-27	9704	200	8.3	--	114	25	26
A-16-09 28CBC	GW	120VLCC	66-09-22	1028	416	7.4	--	206	0	46
A-17-01 31B UNSURV	GW	341MRTN	77-06-07	1028	700	7.5	17.5	330	62	54
A-17-02 03AAA	SP	310SUPI	77-06-08	1028	350	7.4	18.5	170	0	40
A-17-03 05C UNSURV	SP	330RDLL	51-10-10	1028	569	--	19.0	318	12	78
A-17-03 05D UNSURV	SP	330RDLL	51-10-10	1028	543	--	19.5	290	11	72
	SP	330RDLL	52-02-16	1028	525	--	19.5	--	--	--
	SP	330RDLL	52-12-13	1028	520	--	19.5	--	--	--
A-17-04 15CDC	GW	310SUPI	78-04-03	1028	900	7.7	--	410	180	95
A-17-05 01DBC1	GW	310SUPI	74-03-14	--	460	--	--	--	--	--
A-17-05 01DBC2	GW	310SUPI	74-03-20	1028	705	7.3	20.0	360	0	92
A-17-05 01DCD	GW	310SUPI	70-04-10	--	760	--	19.0	--	--	--
A-17-05 03DBC	GW	310SUPI	57-05-21	1028	526	7.3	16.5	233	6	54
A-17-05 10CAB	GW	330RDLL	57-05-21	1028	681	7.5	16.5	348	47	77
	GW	330RDLL	64-08-06	9704	--	--	--	300	44	67
A-17-05 10DCA	GW	310SUPI	57-05-21	1028	604	7.3	18.0	317	12	71
	GW	310SUPI	61-12-21	9704	--	--	--	315	48	74
	GW	310SUPI	64-05-11	9704	--	--	--	257	34	53
A-17-05 11CDB	GW	310SUPI	63-07-23	9704	--	--	--	305	42	74
	GW	310SUPI	68-05-29	9704	385	--	--	206	32	49
	GW	310SUPI	72-04-27	9704	476	8.2	--	270	58	65
A-17-05 11DDD	GW	310SUPI	57-05-21	1028	330	7.4	16.0	170	0	40
	GW	310SUPI	74-03-13	--	320	--	18.0	--	--	--
A-17-05 12BBD	GW	310SUPI	64-05-11	9704	--	--	--	260	40	61
	GW	310SUPI	66-08-01	9704	548	--	--	280	50	67
	GW	310SUPI	72-04-27	9704	400	7.2	--	274	64	70
A-17-05 12CCD	GW	310SUPI	73-01-16	9704	286	8.0	--	192	56	39
A-17-05 12DCC	GW	310SUPI	61-02-27	9704	--	--	--	155	12	34
A-17-05 13ABB	GW	310SUPI	74-04-18	--	310	--	14.0	--	--	--
A-17-05 14ABD	GW	310SUPI	57-05-21	1028	314	7.6	16.0	158	0	35
	GW	310SUPI	63-08-01	9704	294	--	--	148	--	33

LOCAL IDENT- I- FIER	DATE OF SAMPLE	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	SODIUM AD- SORP- TION RATIO	SODIUM+ POTAS- SIUM DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)
A-16-06 09CCA	72-03-28	90	10	.2	--	--	270	0	81	25
A-16-06 17BAB	74-04-10	--	--	--	--	--	--	--	--	--
A-16-06 17CBB2	74-04-17	--	--	--	--	--	--	--	--	--
A-16-06 17CBD	74-06-11	13	7.4	.3	--	1.2	155	0	3.6	3.9
A-16-06 18BBC	73-04-11	10	9.0	.3	--	--	188	0	7.0	4.0
	74-04-19	--	--	--	--	--	--	--	--	--
A-16-06 18CDB	72-02-01	13	8.0	.3	--	--	195	8	<6.0	1.0
	73-01-17	22	2.0	.1	--	--	261	0	6.0	4.0
A-16-06 19BBC	74-04-17	--	--	--	--	--	--	--	--	--
A-16-06 19BCD	72-04-27	12	6.0	.2	--	--	132	--	<6.0	5.0
A-16-09 28CBC	66-09-22	22	--	--	14	--	262	0	9.0	8.0
A-17-01 31B UNSURV	77-06-07	48	22	.5	--	1.8	330	0	30	43
A-17-02 03AAA	77-06-08	17	5.9	.2	--	1.3	210	0	2.7	3.5
A-17-03 05C UNSURV	51-10-10	30	--	--	.0	--	373	--	4.7	4.0
A-17-03 05D UNSURV	51-10-10	27	--	--	5.8	--	341	--	7.6	10
	52-02-16	--	--	--	--	--	339	--	--	6.0
	52-12-13	--	--	--	--	--	341	--	--	6.0
A-17-04 15CDC	78-04-03	41	16	.3	--	1.7	270	0	12	90
A-17-05 01DBC1	74-03-14	--	--	--	--	--	--	--	--	--
A-17-05 01DBC2	74-03-20	32	11	.3	--	1.6	457	0	5.4	16
A-17-05 01DCD	70-04-10	--	--	--	--	--	--	--	--	--
A-17-05 03DBC	57-05-21	24	--	.8	29	--	277	0	10	42
A-17-05 10CAB	57-05-21	38	--	.0	.5	--	368	0	7.2	28
	64-08-06	33	17	.4	--	--	363	--	7.0	27
A-17-05 10DCA	57-05-21	34	--	.3	11	--	373	0	6.6	20
	61-12-21	31	11	.3	--	--	396	--	4.0	16
	64-05-11	30	13	.4	--	--	312	--	7.0	7.0
A-17-05 11CDB	63-07-23	29	11	.3	--	--	375	--	5.0	15
	68-05-29	20	7.0	.2	--	--	258	--	<5.0	7.0
	72-04-27	26	11	.3	--	--	314	0	6.0	16
A-17-05 11DDD	57-05-21	17	--	.2	6.9	--	211	0	4.1	4.5
	74-03-13	--	--	--	--	--	--	--	--	--
A-17-05 12BBD	64-05-11	26	9.0	.2	--	--	317	--	7.0	9.0
	66-08-01	27	9.0	.2	--	--	341	--	6.0	9.0
	72-04-27	24	7.0	.2	--	--	312	0	<6.0	10
A-17-05 12CCD	73-01-16	23	5.0	.2	--	--	202	0	<6.0	31
A-17-05 12DCC	61-02-27	17	5.0	.2	--	--	207	--	<1.0	4.0
A-17-05 13ABB	74-04-18	--	--	--	--	--	--	--	--	--
A-17-05 14ABD	57-05-21	17	--	.3	7.8	--	201	--	4.3	3.0
	63-08-01	16	5.0	.2	--	--	--	--	4.0	3.0

LOCAL IDENT- I- FIER	DATE OF SAMPLE	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	PHOS- PHATE, ORTHO, DIS- SOLVED (MG/L AS PO4)
A-16-06 09CCA	72-03-28	.3	--	--	360	--	1.4	--	--	--
A-16-06 17BAB	74-04-10	--	--	--	--	--	--	--	--	--
A-16-06 17CBB2	74-04-17	--	--	--	--	--	--	--	--	--
A-16-06 17CBD	74-06-11	.0	19	141	152	.19	--	.13	.03	.09
A-16-06 18BBC	73-04-11	.2	--	--	200	--	.23	--	--	--
	74-04-19	--	--	--	--	--	--	--	--	--
A-16-06 18CDB	72-02-01	.5	--	--	195	--	--	--	--	--
	73-01-17	.2	--	--	234	--	.45	--	--	--
A-16-06 19BBC	74-04-17	--	--	--	--	--	--	--	--	--
A-16-06 19BCD	72-04-27	.1	--	--	134	--	--	--	--	--
A-16-09 28CBC	66-09-22	.2	36	--	264	--	--	--	--	--
A-17-01 31B UNSURV	77-06-07	.4	20	--	420	--	--	8.5	.01	.03
A-17-02 03AAA	77-06-08	.1	16	--	191	--	--	.20	.03	.09
A-17-03 05C UNSURV	51-10-10	.2	15	--	318	.43	--	--	--	--
A-17-03 05D UNSURV	51-10-10	.2	15	--	307	.42	--	--	--	--
	52-02-16	--	--	--	--	--	--	--	--	--
	52-12-13	--	--	--	--	--	--	--	--	--
A-17-04 15CDC	78-04-03	.1	15	--	506	.69	--	23	.01	.03
A-17-05 01DBC1	74-03-14	--	--	--	--	--	--	--	--	--
A-17-05 01DBC2	74-03-20	.2	17	383	402	.52	.23	.23	.01	.03
A-17-05 01DCD	70-04-10	--	--	--	--	--	--	--	--	--
A-17-05 03DBC	57-05-21	.2	12	--	308	.42	.07	--	--	--
A-17-05 10CAB	57-05-21	.2	15	--	348	.47	.16	--	--	--
	64-06-06	.1	--	--	361	--	.23	--	--	--
A-17-05 10DCA	57-05-21	.2	19	--	346	.47	.16	--	--	--
	61-12-21	.1	--	--	340	--	.23	--	--	--
	64-05-11	<.1	--	--	305	--	.45	--	--	--
A-17-05 11CDB	63-07-23	.1	--	--	353	--	.23	--	--	--
	68-05-29	.1	--	--	240	--	.23	--	--	--
	72-04-27	.1	--	--	308	--	.23	--	--	--
A-17-05 11DDD	57-05-21	.2	19	--	196	.27	.16	--	--	--
	74-03-13	--	--	--	--	--	--	--	--	--
A-17-05 12BBD	64-05-11	<1.0	--	--	291	--	.45	--	--	--
	66-08-01	.2	--	--	355	--	.45	--	--	--
	72-04-27	.1	--	--	250	--	.23	--	--	--
A-17-05 12CCD	73-01-16	.1	--	--	160	--	.23	--	--	--
A-17-05 12DCC	61-02-27	.1	--	--	275	--	.23	--	--	--
A-17-05 13ABB	74-04-18	--	--	--	--	--	--	--	--	--
A-17-05 14ABD	57-05-21	.4	18	--	165	.25	.14	--	--	--
	63-08-01	.1	--	--	--	--	.45	--	--	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
A-16-06 09CCA	72-03-28	<10	--	--	<10	<10	<50	<50	--	<50
A-16-06 17BAB	74-04-10	--	--	--	--	--	--	--	--	--
A-16-06 17CBB2	74-04-17	--	--	--	--	--	--	--	--	--
A-16-06 17CBD	74-06-11	--	--	40	--	--	--	--	10	--
A-16-06 18BBC	73-04-11	10	--	--	<10	<10	<50	<50	--	<50
	74-04-19	--	--	--	--	--	--	--	--	--
A-16-06 18CDB	72-02-01	10	--	--	<10	<10	900	900	--	<50
	73-01-17	<10	--	--	<10	<10	<50	<50	--	<50
A-16-06 19BBC	74-04-17	--	--	--	--	--	--	--	--	--
A-16-06 19BCD	72-04-27	30	--	--	<10	<10	<50	<50	--	<50
A-16-09 28CBC	66-09-22	--	--	--	--	--	--	0	--	--
A-17-01 31B UNSURV	77-06-07	--	--	70	--	--	--	--	10	--
A-17-02 03AAA	77-06-08	--	--	30	--	--	--	--	10	--
A-17-03 05C UNSURV	51-10-10	--	--	--	--	--	--	--	--	--
A-17-03 05D UNSURV	51-10-10	--	--	--	--	--	--	--	--	--
	52-02-16	--	--	100	--	--	--	--	--	--
	52-12-13	--	--	--	--	--	--	--	--	--
A-17-04 15CDC	78-04-03	--	3	40	--	--	--	--	10	--
A-17-05 01DBC1	74-03-14	--	--	--	--	--	--	--	--	--
A-17-05 01DBC2	74-03-20	--	--	40	--	--	--	--	80	--
A-17-05 01DCD	70-04-10	--	--	--	--	--	--	--	--	--
A-17-05 03DBC	57-05-21	--	--	--	--	--	--	120	0	--
A-17-05 10CAB	57-05-21	--	--	--	--	--	--	110	0	--
	64-08-06	--	--	--	--	<10	<50	<50	--	--
A-17-05 10DCA	57-05-21	--	--	--	--	--	--	--	--	--
	61-12-21	--	--	--	--	--	--	20	--	--
	64-05-11	--	--	--	--	<10	50	<50	--	--
A-17-05 11CDB	63-07-23	<5	--	--	--	<10	<50	<50	--	--
	68-05-29	--	--	--	--	--	--	1270	--	--
	72-04-27	<10	--	--	<10	<10	<50	<50	--	<50
A-17-05 11DDD	57-05-21	--	--	--	--	--	--	3700	10	--
	74-03-13	--	--	--	--	--	--	--	--	--
A-17-05 12BBD	64-05-11	--	--	--	--	<10	<50	<50	--	--
	66-08-01	--	--	--	--	<10	<50	<50	--	--
	72-04-27	<10	--	--	<10	<10	<50	<50	--	<50
A-17-05 12CCD	73-01-16	<10	--	--	<10	<10	<50	<50	--	<50
A-17-05 12DCC	61-02-27	--	--	--	--	--	--	<50	--	--
A-17-05 13ABB	74-04-18	--	--	--	--	--	--	--	--	--
A-17-05 14ABD	57-05-21	--	--	--	--	--	--	20	0	--
	63-08-01	--	--	--	--	--	--	--	--	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	SELE-NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)
A-16-06 09CCA	72-03-28	<50	--	<.5	<10	<10	300
A-16-06 17BAB	74-04-10	--	--	--	--	--	--
A-16-06 17CBB2	74-04-17	--	--	--	--	--	--
A-16-06 17CBD	74-06-11	--	--	--	--	--	--
A-16-06 18BBC	73-04-11	<50	--	<.5	<10	<10	400
	74-04-19	--	--	--	--	--	--
A-16-06 18CDB	72-02-01	<50	--	<.5	<10	<10	<50
	73-01-17	<50	--	<.5	<10	<10	<50
A-16-06 19BBC	74-04-17	--	--	--	--	--	--
A-16-06 19BCD	72-04-27	<50	--	<.5	<10	<10	100
A-16-09 28CBC	66-09-22	--	--	--	--	--	--
A-17-01 31B UNSURV	77-06-07	--	20	--	--	--	--
A-17-02 03AAA	77-06-08	--	0	--	--	--	--
A-17-03 05C UNSURV	51-10-10	--	--	--	--	--	--
A-17-03 05D UNSURV	51-10-10	--	--	--	--	--	--
	52-02-16	--	--	--	--	--	--
	52-12-13	--	--	--	--	--	--
A-17-04 15CDC	78-04-03	--	10	--	--	--	--
A-17-05 01DBC1	74-03-14	--	--	--	--	--	--
A-17-05 01DBC2	74-03-20	--	--	--	--	--	--
A-17-05 01DCD	70-04-10	--	--	--	--	--	--
A-17-05 03DBC	57-05-21	--	--	--	--	--	--
A-17-05 10CAB	57-05-21	--	--	--	--	--	--
	64-08-06	--	--	--	--	--	--
A-17-05 10DCA	57-05-21	--	--	--	--	--	--
	61-12-21	<50	--	--	--	--	--
	64-05-11	--	--	--	--	--	--
A-17-05 11CDB	63-07-23	<50	--	--	--	--	--
	68-05-29	--	--	--	--	--	--
	72-04-27	<50	--	<.5	<10	<10	100
A-17-05 11DDD	57-05-21	--	--	--	--	--	--
	74-03-13	--	--	--	--	--	--
A-17-05 12BBD	64-05-11	--	--	--	--	--	--
	66-08-01	--	--	--	--	--	--
	72-04-27	<50	--	<.5	<10	<10	300
A-17-05 12CCD	73-01-16	<50	--	<.5	<10	<10	300
A-17-05 12DCC	61-02-27	<50	--	--	--	--	--
A-17-05 13ABB	74-04-18	--	--	--	--	--	--
A-17-05 14ABD	57-05-21	--	--	--	--	--	--
	63-08-01	--	--	--	--	--	--

LOCAL IDENT-I-FIER	SITE	GEO-LOGIC UNIT	DATE OF SAMPLE	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)
A-17-05 14ABD	GW	310SUPI	64-05-07	9704	--	--	--	--	--	--
	GW	310SUPI	66-04-09	9704	322	--	--	149	21	34
	GW	310SUPI	68-05-26	9704	286	--	--	152	23	33
A-17-05 14BCD	GW	310SUPI	74-03-13	--	290	--	18.0	--	--	--
A-17-05 15AAB	GW	310SUPI	63-07-23	9704	--	--	--	156	21	33
	GW	310SUPI	68-05-25	9704	333	--	--	165	27	36
	GW	310SUPI	72-04-27	9704	278	8.3	--	106	0	38
A-17-05 15ABD	GW	310SUPI	62-05-08	9704	--	--	--	158	12	28
A-17-05 15ADC	GW	310SUPI	68-05-28	9704	476	--	--	260	38	60
A-17-05 19AAA	GW	310SUPI	73-01-17	9704	--	--	--	226	59	54
	GW	310SUPI	74-02-28	1028	399	7.6	20.0	200	0	47
A-17-05 24ADA	GW	310SUPI	63-08-02	9704	--	--	--	214	--	46
A-17-05 24CDC	GW	310SUPI	57-05-21	1028	481	7.3	15.5	248	0	60
A-17-05 25AAA	GW	310SUPI	72-04-27	9704	286	8.5	--	198	30	47
A-17-05 25BBD	GW	330RDLL	57-04-09	9704	--	--	--	170	--	39
	GW	330RDLL	57-05-23	1028	345	7.3	16.5	178	0	40
	GW	330RDLL	59-05-25	9704	--	8.2	--	176	--	38
	GW	330RDLL	61-03-13	9704	--	--	--	180	--	39
	GW	330RDLL	64-05-11	9704	--	--	--	156	20	30
A-17-05 25BDB	GW	310SUPI	74-04-23	--	420	--	13.0	--	--	--
A-17-05 26BAB1	GW	310SUPI	74-04-17	--	700	--	11.5	--	--	--
A-17-05 26BAB2	GW	310SUPI	75-01-17	1028	700	--	--	350	27	71
A-17-05 26BAD	GW	310SUPI	61-12-27	9704	--	--	--	300	69	64
	GW	310SUPI	72-06-25	9704	500	7.2	--	298	60	36
A-17-05 26BBB	GW	310SUPI	74-04-10	--	610	--	16.0	--	--	--
A-17-05 26BDB1	GW	310SUPI	51-12-26	9704	--	--	--	270	--	62
	GW	310SUPI	73-08-30	9704	--	8.3	--	308	--	77
A-17-05 26CAA1	GW	310SUPI	71-08-17	9704	526	--	--	256	44	66
	GW	310SUPI	74-05-31	--	500	--	18.5	--	--	--
A-17-05 27DAB2	GW	310SUPI	74-04-17	--	710	--	16.0	--	--	--
A-17-05 27DAB5	GW	310SUPI	74-06-25	--	475	--	17.0	--	--	--
	GW	310SUPI	75-01-17	1028	600	8.1	16.0	300	1	64
A-17-05 27DAC	GW	310SUPI	74-03-21	--	600	--	14.5	--	--	--
A-17-05 27DBA1	GW	310SUPI	75-01-17	1028	425	7.9	--	230	10	48
A-17-05 27DBA3	GW	310SUPI	74-03-14	--	710	--	10.0	--	--	--
A-17-05 27DBD2	GW	310SUPI	74-04-17	--	680	--	11.0	--	--	--
	GW	310SUPI	75-01-17	1028	600	7.9	--	300	1	62
A-17-05 27DBD3	GW	310SUPI	71-12-14	9704	645	--	--	340	--	74
A-17-05 29BBD	GW	310SUPI	74-04-23	--	420	--	13.5	--	--	--
A-17-05 33ACA	GW	310SUPI	57-05-22	1028	667	7.4	16.5	316	2	59

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM+ POTAS-SIUM DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)
A-17-05 14ABD	64-05-07	--	--	--	--	--	--	--	--	--
	66-04-09	16	7.0	.2	--	--	190	--	<1.0	3.0
	68-05-26	17	5.0	.2	--	--	191	--	<5.0	3.0
A-17-05 14BCD	74-03-13	--	--	--	--	--	--	--	--	--
A-17-05 15AAB	63-07-23	18	5.0	.2	--	--	200	--	5.0	4.0
	68-05-25	18	6.0	.2	--	--	205	--	<5.0	5.0
	72-04-27	17	5.0	.2	--	--	188	0	<6.0	5.0
A-17-05 15ABD	62-05-08	21	8.0	.3	--	--	195	--	7.0	6.0
A-17-05 15ADC	68-05-28	26	9.0	.2	--	--	317	--	<5.0	9.0
A-17-05 19AAA	73-01-17	22	2.0	.1	--	--	261	--	6.0	4.0
	74-02-28	20	6.1	.2	--	1.3	243	0	4.6	5.3
A-17-05 24ADA	63-08-02	24	6.0	.2	--	--	--	--	<1.0	4.0
A-17-05 24CDC	57-05-21	24	--	.2	8.5	--	311	0	4.9	4.0
A-17-05 25AAA	72-04-27	19	4.0	.1	--	--	224	10	<6.0	4.0
A-17-05 25BBD	57-04-09	17	4.0	.1	--	--	--	--	<1.0	5.0
	57-05-23	19	--	.2	5.1	--	218	0	3.1	5.0
	59-05-25	19	6.0	.2	--	--	--	0	<1.0	4.0
	61-03-13	20	5.0	.2	--	--	--	--	<1.0	4.0
	64-05-11	19	6.0	.2	--	--	197	--	7.0	4.0
A-17-05 25BDB	74-04-23	--	--	--	--	--	--	--	--	--
A-17-05 26BAB1	74-04-17	--	--	--	--	--	--	--	--	--
A-17-05 26BAB2	75-01-17	41	10	.2	--	2.1	389	--	18	18
A-17-05 26BAD	61-12-27	34	9.0	.2	--	--	344	--	9.0	13
	72-06-25	50	9.0	.2	--	--	354	0	12	16
A-17-05 26BBB	74-04-10	--	--	--	--	--	--	--	--	--
A-17-05 26BDB1	61-12-26	29	8.0	.2	--	--	--	--	4.0	4.0
	73-08-30	28	8.0	.2	--	--	--	0	20	10
A-17-05 26CAA1	71-08-17	22	10	.3	--	--	314	--	9.0	12
	74-05-31	--	--	--	--	--	--	--	--	--
A-17-05 27DAB2	74-04-17	--	--	--	--	--	--	--	--	--
A-17-05 27DAB5	74-06-25	--	--	--	--	--	--	--	--	--
	75-01-17	35	15	.4	--	1.3	369	0	9.1	14
A-17-05 27DAC	74-03-21	--	--	--	--	--	--	--	--	--
A-17-05 27DBA1	75-01-17	26	12	.3	--	1.5	265	0	9.2	15
A-17-05 27DBA3	74-03-14	--	--	--	--	--	--	--	--	--
A-17-05 27DBD2	74-04-17	--	--	--	--	--	--	--	--	--
	75-01-17	35	12	.3	--	2.0	363	0	7.1	15
A-17-05 27DBD3	71-12-14	37	17	.4	--	--	--	--	14	14
A-17-05 29BBD	74-04-23	--	--	--	--	--	--	--	--	--
A-17-05 33ACA	57-05-22	41	--	.7	27	--	382	0	16	24

LOCAL IDENT-I-FIER	DATE OF SAMPLE	FLUORIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
A-17-05 14ABD	64-05-07	--	--	--	194	--	--	--	--	--
	66-04-09	.1	--	--	180	--	.45	--	--	--
	68-05-26	.0	--	--	180	--	.23	--	--	--
A-17-05 14BCD	74-03-13	--	--	--	--	--	--	--	--	--
A-17-05 15AAB	63-07-23	.1	--	--	195	--	.23	--	--	--
	68-05-25	.1	--	--	260	--	.45	--	--	--
	72-04-27	.1	--	--	175	--	.23	--	--	--
A-17-05 15ABD	62-05-08	.2	--	--	--	--	.45	--	--	--
A-17-05 15ADC	68-05-28	.1	--	--	310	--	.45	--	--	--
A-17-05 19AAA	73-01-17	.2	--	--	--	--	.45	--	--	--
	74-02-28	.1	15	239	221	.33	.29	.29	.03	.09
A-17-05 24ADA	63-08-02	<.1	--	--	266	--	--	--	--	--
A-17-05 24CDC	57-05-21	.2	19	--	274	.37	.18	--	--	--
A-17-05 25AAA	72-04-27	.1	--	--	180	--	.23	--	--	--
A-17-05 25BBD	57-04-09	.1	--	--	194	--	--	--	--	--
	57-05-23	.2	16	--	196	.27	--	--	--	--
	59-05-25	.1	--	--	158	--	--	--	--	--
	61-03-13	.1	--	--	205	--	--	--	--	--
	64-05-11	<.1	--	--	181	--	--	--	--	--
A-17-05 25BDB	74-04-23	--	--	--	--	--	--	--	--	--
A-17-05 26BAB1	74-04-17	--	--	--	--	--	--	--	--	--
A-17-05 26BAB2	75-01-17	.1	19	373	380	.51	2.0	2.0	.01	.03
A-17-05 26BAD	61-12-27	.2	--	--	323	--	.90	--	--	--
	72-06-25	.3	--	--	325	--	1.1	--	--	--
A-17-05 26BBB	74-04-10	--	--	--	--	--	--	--	--	--
A-17-05 26BDB1	61-12-26	.2	--	285	--	--	--	--	--	--
	73-08-30	.2	--	285	--	--	--	--	--	--
A-17-05 26CAA1	71-08-17	.4	--	--	340	--	--	--	--	--
	74-05-31	--	--	--	--	--	--	--	--	--
A-17-05 27DAB2	74-04-17	--	--	--	--	--	--	--	--	--
A-17-05 27DAB5	74-06-25	--	--	--	--	--	--	--	--	--
	75-01-17	.1	20	338	347	.46	1.5	1.5	.05	.15
A-17-05 27DAC	74-03-21	--	--	--	--	--	--	--	--	--
A-17-05 27DBA1	75-01-17	.1	19	262	264	.36	.55	.55	.02	.06
A-17-05 27DBA3	74-03-14	--	--	--	--	--	--	--	--	--
A-17-05 27DBD2	74-04-17	--	--	--	--	--	--	--	--	--
	75-01-17	.1	20	334	339	.45	1.5	1.5	.04	.12
A-17-05 27DBD3	71-12-14	.3	--	--	415	--	--	--	--	--
A-17-05 29BBD	74-04-23	--	--	--	--	--	--	--	--	--
A-17-05 33ACA	57-05-22	.2	19	--	386	.52	2.7	--	--	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
A-17-05 14ABD	64-05-07	--	--	--	--	<10	<50	--	--	--
	66-04-09	--	--	--	--	<10	<50	<50	--	--
	68-05-26	--	--	--	--	<10	--	<50	--	--
A-17-05 14BCD	74-03-13	--	--	--	--	--	--	--	--	--
A-17-05 15AAB	63-07-23	<5	--	--	--	<10	<50	150	--	--
	68-05-25	--	--	--	--	<10	--	<50	--	--
	72-04-27	<10	--	--	<10	<10	<50	<50	--	<50
A-17-05 15ABD	62-05-08	--	--	--	--	--	--	--	--	--
A-17-05 15ADC	68-05-28	--	--	--	--	<10	--	<50	--	--
A-17-05 19AAA	73-01-17	--	--	--	--	--	--	--	--	--
	74-02-28	--	--	20	--	--	--	--	40	--
A-17-05 24ADA	63-08-02	--	--	--	--	<10	<50	3100	--	--
A-17-05 24CDC	57-05-21	--	--	--	--	--	--	40	0	--
A-17-05 25AAA	72-04-27	<10	--	--	<10	<10	<50	<50	--	<50
A-17-05 25BBD	57-04-09	--	--	--	--	--	--	140	--	--
	57-05-23	--	--	--	--	--	--	50	10	--
	59-05-25	--	--	--	--	--	--	<50	--	--
	61-03-13	--	--	--	--	--	--	<50	--	--
	64-05-11	--	--	--	--	<10	<50	130	--	--
A-17-05 25BDB	74-04-23	--	--	--	--	--	--	--	--	--
A-17-05 26BAB1	74-04-17	--	--	--	--	--	--	--	--	--
A-17-05 26BAB2	75-01-17	--	--	60	--	--	--	--	20	--
A-17-05 26BAD	61-12-27	--	--	--	--	--	--	<50	--	--
	72-06-25	<10	--	--	<10	<10	<50	<50	--	<50
A-17-05 26BBB	74-04-10	--	--	--	--	--	--	--	--	--
A-17-05 26BDB1	61-12-26	--	--	--	--	--	--	<50	--	--
	73-08-30	<10	--	--	<10	<10	<50	<500	--	<50
A-17-05 26CAA1	71-08-17	--	--	--	--	<10	<50	<50	--	--
	74-05-31	--	--	--	--	--	--	--	--	--
A-17-05 27DAB2	74-04-17	--	--	--	--	--	--	--	--	--
A-17-05 27DAB5	74-06-25	--	--	--	--	--	--	--	--	--
	75-01-17	--	--	50	--	--	--	--	20	--
A-17-05 27DAC	74-03-21	--	--	--	--	--	--	--	--	--
A-17-05 27DBA1	75-01-17	--	--	60	--	--	--	--	30	--
A-17-05 27DBA3	74-03-14	--	--	--	--	--	--	--	--	--
A-17-05 27DBB2	74-04-17	--	--	--	--	--	--	--	--	--
	75-01-17	--	--	60	--	--	--	--	10	--
A-17-05 27DBD3	71-12-14	<10	--	--	<10	<10	<50	<50	--	<50
A-17-05 29BBD	74-04-23	--	--	--	--	--	--	--	--	--
A-17-05 33ACA	57-05-22	--	--	--	--	--	--	--	--	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	SELE-NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)
A-17-05 14ABD	64-05-07	--	--	--	--	--	--
	66-04-09	--	--	--	--	--	--
	68-05-26	--	--	--	--	--	--
A-17-05 14BCD	74-03-13	--	--	--	--	--	--
A-17-05 15AAB	63-07-23	<50	--	--	--	--	--
	68-05-25	--	--	--	--	--	--
	72-04-27	<50	--	<.5	<10	<10	<50
A-17-05 15ABD	62-05-08	--	--	--	--	--	--
A-17-05 15ADC	68-05-28	--	--	--	--	--	--
A-17-05 19AAA	73-01-17	--	--	--	--	--	--
	74-02-28	--	--	--	--	--	--
A-17-05 24ADA	63-08-02	500	--	--	--	--	--
A-17-05 24CDC	57-05-21	--	--	--	--	--	--
A-17-05 25AAA	72-04-27	<50	--	<.5	<10	<10	<50
A-17-05 25BBD	57-04-09	--	--	--	--	--	--
	57-05-23	--	--	--	--	--	--
	59-05-25	<50	--	--	--	--	--
	61-03-13	<50	--	--	--	--	--
	64-05-11	--	--	--	--	--	--
A-17-05 25BDB	74-04-23	--	--	--	--	--	--
A-17-05 26BAB1	74-04-17	--	--	--	--	--	--
A-17-05 26BAB2	75-01-17	--	--	--	--	--	--
A-17-05 26BAD	61-12-27	--	<50	--	--	--	--
	72-06-25	<50	--	<.5	<10	<10	140
A-17-05 26BBB	74-04-10	--	--	--	--	--	--
A-17-05 26BDB1	61-12-26	<50	--	--	--	--	--
	73-08-30	<50	--	<.5	<10	<10	100
A-17-05 26CAA1	71-08-17	70	--	--	--	--	800
	74-05-31	--	--	--	--	--	--
A-17-05 27DAB2	74-04-17	--	--	--	--	--	--
A-17-05 27DAB5	74-06-25	--	--	--	--	--	--
	75-01-17	--	--	--	--	--	--
A-17-05 27DAC	74-03-21	--	--	--	--	--	--
A-17-05 27DBA1	75-01-17	--	--	--	--	--	--
A-17-05 27DBA3	74-03-14	--	--	--	--	--	--
A-17-05 27DBD2	74-04-17	--	--	--	--	--	--
	75-01-17	--	--	--	--	--	--
A-17-05 27DBD3	71-12-14	<50	--	<.5	<10	<10	<50
A-17-05 29BBD	74-04-23	--	--	--	--	--	--
A-17-05 33ACA	57-05-22	--	--	--	--	--	--

LOCAL IDENT-I-FIER	SITE	GEO-LOGIC UNIT	DATE OF SAMPLE	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)
A-17-05 33BCB	GW	310SUPI	57-05-22	1028	437	7.3	15.0	226	0	51
	GW	310SUPI	72-05-04	9704	345	7.6	--	202	26	59
A-17-05 34AAA	GW	310SUPI	57-05-22	1028	540	7.3	16.5	288	0	56
A-17-05 35DAC	GW	310SUPI	74-05-08	--	350	--	13.0	--	--	--
A-17-05 36CDB	GW	330RDLL	74-12-04	9801	--	8.0	--	108	0	25
A-17-06 06DCA	GW	341MRTN	74-05-10	1028	2350	6.3	21.5	1500	0	320
A-17-06 08BAA	GW	330RDLL	77-04-14	1028	340	7.3	15.0	170	0	38
A-17-06 08BCD	GW	310SUPI	62-05-08	9704	--	--	--	160	11	37
	GW	310SUPI	66-04-12	9704	322	--	--	154	23	33
	GW	310SUPI	72-04-27	9704	278	8.2	--	170	34	39
A-17-06 18ADD1	GW	310SUPI	62-01-19	9704	--	--	--	200	--	48
	GW	310SUPI	63-02-03	9704	376	--	--	188	--	45
	GW	310SUPI	64-05-09	9704	351	--	--	--	--	--
	GW	310SUPI	67-01-16	1028	410	7.4	--	212	0	50
	GW	310SUPI	68-05-25	9704	370	--	--	204	--	46
	GW	310SUPI	72-04-27	9704	330	8.3	--	204	46	49
A-17-06 19BAC	GW	310SUPI	57-05-22	1028	424	7.2	15.0	222	0	46
A-17-06 19BBC2	GW	310SUPI	72-04-27	9704	280	8.3	--	184	41	42
A-17-06 30BBB	GW	310SUPI	57-05-22	1028	343	7.1	15.5	173	0	38
A-18-03 32A UNSURV	SP	330RDLL	51-10-10	1028	541	--	25.0	300	13	71
A-18-04 15DBC	GW	310SUPI	74-03-05	1028	998	7.8	10.0	530	93	80
A-18-04 25BCB	GW	--	58-10-10	1028	665	7.5	16.5	351	25	78
A-18-05 27ABB	GW	330RDLL	58-10-10	1028	829	7.5	--	300	53	71
A-18-05 29ADC	GW	330RDLL	74-03-06	1028	869	7.4	15.0	450	87	100
A-18-05 31BCD	GW	330RDLL	74-03-19	1028	694	7.7	14.0	340	14	72
A-18-06 08ACD	SP	--	74-03-06	1028	298	7.8	8.5	160	0	34
A-18-07 15CCB2	GW	111ALVM	65-07-23	1028	--	7.9	10.0	101	0	25
	GW	111ALVM	72-04-27	9704	--	8.2	--	110	12	27
A-18-07 15CCB3	GW	111ALVM	65-07-23	1028	214	7.9	10.0	101	0	25
A-18-07 15CCC1	GW	111ALVM	66-05-18	9801	--	7.8	--	136	10	54
A-18-07 15CCC2	GW	310CCNN	77-10-31	1028	240	8.2	13.0	130	0	23
A-18-07 15CCC3	GW	111ALVM	75-01-08	9704	232	7.5	--	114	4	32
A-18-07 27CBB	GW	310SUPI	65-09-07	1028	--	7.2	16.5	74	0	17
A-18-09 28DBD	GW	120VLCC	71-09-23	1028	800	7.6	--	360	31	56
A-18-09 29CAA	GW	120VLCC	67-11-15	1028	343	--	--	162	6	26
A-19-01 33BBD	GW	341MRTN	77-06-07	1028	350	7.5	--	180	0	44
A-19-06 15DDD1	SP	310CCNN	46-06-10	1028	270	--	11.0	134	0	32
A-19-06 15DDD2	SP	310CCNN	49-07-31	1028	372	--	14.0	199	5	50
A-19-06 27EBCC	SP	310SUPI	46-06-10	1028	279	--	12.0	--	--	--
	SP	310SUPI	49-08-17	1028	475	--	12.0	267	6	61

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM+ POTAS-SIUM DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)
A-17-05 33BCB	57-05-22	24	--	.2	8.0	--	283	0	4.9	4.0
	72-05-04	13	4.0	.1	--	--	261	0	6.0	5.0
A-17-05 34AAA	57-05-22	36	11	.3	11	--	362	0	45	6.0
A-17-05 35DAC	74-05-08	--	--	--	--	--	--	--	--	--
A-17-05 36CDB	74-12-04	11	20	.8	--	--	151	0	4.0	12
A-17-06 06DCA	74-05-10	170	20	.2	--	2.5	1840	0	14	32
A-17-06 08BAA	77-04-14	18	4.4	.1	--	.9	210	0	3.8	2.8
A-17-06 08BCD	62-05-08	16	5.0	.2	--	--	201	--	<1.0	4.0
	66-04-12	17	7.0	.2	--	--	195	--	6.0	3.0
	72-04-27	17	4.0	.1	--	--	202	0	<6.0	4.0
A-17-06 18ADD1	62-01-19	20	6.0	.2	--	--	--	--	<1.0	4.0
	63-02-03	18	6.0	.2	--	--	--	--	<1.0	3.0
	64-05-09	--	--	--	--	--	--	--	--	--
	67-01-16	21	--	--	8.5	--	262	0	8.0	5.0
	68-05-25	21	5.0	.2	--	--	--	--	<5.0	4.0
	72-04-27	20	5.0	.2	--	--	234	0	<6.0	6.0
A-17-06 19BAC	57-05-22	26	--	.2	7.1	--	276	0	3.7	5.0
A-17-06 19BBC2	72-04-27	19	5.0	.2	--	--	212	0	<6.0	5.0
A-17-06 30BBB	57-05-22	19	--	.3	10	--	226	0	4.1	3.5
A-18-03 32A UNSURV	51-10-10	30	--	--	.5	--	351	--	5.8	4.0
A-18-04 15DBC	74-03-05	80	13	.2	--	5.2	532	0	63	38
A-18-04 25BCB	58-10-10	38	--	.1	4.8	--	398	0	2.5	18
A-18-05 27ABB	58-10-10	30	--	1.4	58	--	302	0	16	114
A-18-05 29ADC	74-03-06	48	12	.2	--	1.9	439	0	79	30
A-18-05 31BCD	74-03-19	40	15	.4	--	2.1	403	0	13	28
A-18-06 08ACD	74-03-06	17	4.9	.2	--	1.1	169	0	1.3	2.2
A-18-07 15CCB2	65-07-23	9.4	--	--	6.2	--	128	0	4.0	4.0
	72-04-27	11	4.0	.2	--	--	120	0	<6.0	3.0
A-18-07 15CCB3	65-07-23	9.4	--	--	6.2	--	128	0	4.0	4.0
A-18-07 15CCC1	66-05-18	.0	--	--	46	--	154	0	95	8.0
A-18-07 15CCC2	77-10-31	17	6.0	.2	--	1.2	160	0	3.1	1.8
A-18-07 15CCC3	75-01-08	8.0	5.0	.2	--	--	134	0	<6.0	3.0
A-18-07 27CBB	65-09-07	7.7	--	--	12	--	100	0	6.0	8.0
A-18-09 28DBD	71-09-23	53	43	1.0	--	2.7	399	0	42	68
A-18-09 29CAA	67-11-15	24	--	--	10	--	190	--	10	13
A-19-01 33BBD	77-06-07	17	6.0	.2	--	1.5	230	0	5.4	3.4
A-19-06 15DDD1	46-08-10	13	--	--	9.2	--	163	--	2.9	3.0
A-19-06 15DDD2	49-07-31	18	--	--	2.1	--	237	--	4.9	3.0
A-19-06 27EBCC	46-08-10	--	--	--	--	--	167	--	--	3.0
	49-08-17	26	--	--	2.1	--	318	--	2.7	5.0

Table 13.--Chemical analysis of water from selected wells and springs in the upper Verde River area—Continued

LOCAL IDENT- I- FIER	DATE OF SAMPLE	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	PHOS- PHATE, ORTHO, DIS- SOLVED (MG/L AS PO4)
A-17-05 33BCB	57-05-22	.2	17	--	248	.34	.07	--	--	--
	72-05-04	.1	--	--	--	--	--	--	--	--
A-17-05 34AAA	57-05-22	.2	22	--	315	.43	--	--	--	--
A-17-05 35DAC	74-05-08	--	--	--	--	--	--	--	--	--
A-17-05 36CDB	74-12-04	<.2	--	--	225	--	--	--	--	--
A-17-06 06DCA	74-05-10	.4	13	1440	1460	1.96	--	.06	.01	.03
A-17-06 08BAA	77-04-14	.1	16	--	188	.26	--	.08	.02	.06
A-17-06 08BCD	62-05-09	.1	--	--	170	--	.23	--	--	--
	66-04-12	.1	--	--	195	--	.45	--	--	--
	72-04-27	.1	--	--	175	--	.23	--	--	--
A-17-06 18ADD1	62-01-19	.1	--	--	213	--	--	--	--	--
	63-02-03	.2	--	--	210	--	--	--	--	--
	64-05-09	--	--	--	227	--	--	--	--	--
	67-01-16	.2	20	--	242	--	--	--	--	--
	68-05-25	<.1	--	--	235	--	--	--	--	--
	72-04-27	.1	--	--	210	--	.45	--	--	--
A-17-06 19BAC	57-05-22	.2	20	--	244	.33	.07	--	--	--
A-17-06 19BBC2	72-04-27	.1	--	--	175	--	.23	--	--	--
A-17-06 30BBB	57-05-22	.2	17	--	203	.28	--	--	--	--
A-18-03 32A UNSURV	51-10-10	.2	16	--	303	.41	--	--	--	--
A-18-04 15DBC	74-03-05	.5	11	559	565	.76	7.1	7.1	.02	.06
A-18-04 25BCD	58-10-10	1.6	12	--	355	.48	--	--	--	--
A-18-05 27ABB	58-10-10	.2	12	--	451	--	.11	--	--	--
A-18-05 29ADC	74-03-06	.5	13	512	503	.70	.43	--	--	.03
A-18-05 31BCD	74-03-19	.2	12	372	366	.51	1.2	1.2	.00	.00
A-18-06 08ACD	74-03-06	.5	15	160	170	.22	.22	.22	--	.09
A-18-07 15CCB2	65-07-23	.2	--	--	--	--	--	--	--	--
	72-04-27	--	--	--	134	--	--	--	--	--
A-18-07 15CCB3	65-07-23	<.2	--	--	--	--	--	--	--	--
A-18-07 15CCC1	66-05-18	.1	31	--	388	--	--	--	--	--
A-18-07 15CCC2	77-10-31	.1	18	--	151	.21	--	.47	.02	.06
A-18-07 15CCC3	75-01-08	.1	--	--	146	--	--	--	--	--
A-18-07 27CBD	65-09-07	<.2	--	--	--	--	--	--	--	--
A-18-09 23DBD	71-09-23	.5	21	--	490	.66	--	.71	.10	.31
A-18-09 29CAA	67-11-15	.1	33	--	--	--	--	--	--	--
A-19-01 33DBD	77-06-07	.1	15	--	207	--	--	.28	.03	.09
A-19-06 15DDD1	46-08-10	.4	--	--	135	.18	.14	--	--	--
A-19-06 15DDD2	49-07-31	.0	16	--	211	.29	--	--	--	--
A-19-06 27CBCC	46-08-10	.4	--	--	--	--	--	--	--	--
	49-08-17	.2	16	--	--	--	--	--	--	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
A-17-05 33BCB	57-05-22	--	--	--	--	--	--	50	10	--
	72-05-04	--	--	--	--	--	--	--	--	--
A-17-05 34AAA	57-05-22	--	--	--	--	--	--	250	0	--
A-17-05 35DAC	74-05-08	--	--	--	--	--	--	--	--	--
A-17-05 36CDB	74-12-04	--	--	--	--	--	--	<50	--	--
A-17-06 06DCA	74-05-10	--	--	100	--	--	--	--	180	--
A-17-06 08BAA	77-04-14	--	--	5	--	--	--	--	190	--
A-17-06 08BCD	62-05-08	--	--	--	--	--	--	--	--	--
	66-04-12	--	--	--	--	<10	<50	1200	--	--
	72-04-27	<10	--	--	<10	<10	<50	<50	--	<50
A-17-06 18ADD1	62-01-19	--	--	--	--	--	--	<50	--	--
	63-02-03	--	--	--	--	<10	100	<50	--	--
	64-05-09	--	--	--	--	<10	<50	--	--	--
	67-01-16	--	--	--	--	--	--	--	--	--
	68-05-25	--	--	--	--	10	--	<50	--	--
	72-04-27	<10	--	--	<10	<10	<50	<50	--	<50
A-17-06 19BAC	57-05-22	--	--	--	--	--	--	--	--	--
A-17-06 19BBC2	72-04-27	<10	--	--	<10	<10	<50	<50	--	<50
A-17-06 30BBB	57-05-22	--	--	--	--	--	--	570	20	--
A-18-03 32A UNSURV	51-10-10	--	--	--	--	--	--	--	--	--
A-18-04 15DBC	74-03-05	--	--	60	--	--	--	--	10	--
A-18-04 25BCB	58-10-10	--	--	--	--	--	--	--	--	--
A-18-05 27ABB	58-10-10	--	--	--	--	--	--	--	--	--
A-18-05 29ADC	74-03-06	--	--	30	--	--	--	--	20	--
A-18-05 31BCD	74-03-19	--	--	60	--	--	--	--	40	--
A-18-06 08ACD	74-03-06	--	--	10	--	--	--	--	20	--
A-18-07 15CCB2	65-07-23	--	--	--	--	--	--	--	--	--
	72-04-27	<10	--	--	--	--	--	<50	--	--
A-18-07 15CCB3	65-07-23	--	--	--	--	--	--	--	--	--
A-18-07 15CCC1	66-05-18	--	--	--	--	--	--	--	--	--
A-18-07 15CCC2	77-10-31	--	3	9	--	--	--	--	20	--
A-18-07 15CCC3	75-01-08	--	--	--	--	--	--	--	--	--
A-18-07 27CBB	65-09-07	--	--	--	--	--	--	--	--	--
A-18-09 28DBD	71-09-23	--	--	--	--	--	--	--	10	--
A-18-09 29CAA	67-11-15	--	--	--	--	--	--	--	--	--
A-19-01 33BBD	77-06-07	--	--	30	--	--	--	--	10	--
A-19-06 15DDD1	46-08-10	--	--	--	--	--	--	--	--	--
A-19-06 15DDD2	49-07-31	--	--	--	--	--	--	--	--	--
A-19-06 27EBCC	46-08-10	--	--	--	--	--	--	--	--	--
	49-08-17	--	--	--	--	--	--	--	--	--

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	SELE-NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)
A-17-05 33BCB	57-05-22	--	--	--	--	--	--
	72-05-04	--	--	--	--	--	--
A-17-05 34AAA	57-05-22	--	--	--	--	--	--
A-17-05 35DAC	74-05-08	--	--	--	--	--	--
A-17-05 36CDB	74-12-04	--	--	--	--	--	--
A-17-06 06DCA	74-05-10	--	--	--	--	--	--
A-17-06 08BAA	77-04-14	--	20	--	--	--	--
A-17-06 08BCD	62-05-08	--	--	--	--	--	--
	66-04-12	--	--	--	--	--	--
	72-04-27	<50	--	<.5	<10	<10	<50
A-17-06 18ADD1	62-01-19	<50	--	--	--	--	--
	63-02-03	<50	--	--	--	--	--
	64-05-09	--	--	--	--	--	--
	67-01-16	--	--	--	--	--	--
	68-05-25	--	--	--	--	--	--
	72-04-27	<50	--	<.5	<10	<10	<50
A-17-06 19BAC	57-05-22	--	--	--	--	--	--
A-17-06 19BBC2	72-04-27	<50	--	<.5	<10	<10	100
A-17-06 30BBB	57-05-22	--	--	--	--	--	--
A-18-03 32A UNSURV	51-10-10	--	--	--	--	--	--
A-18-04 15DBC	74-03-05	--	--	--	--	--	--
A-18-04 25BCB	58-10-10	--	--	--	--	--	--
A-18-05 27ABB	58-10-10	--	--	--	--	--	--
A-18-05 29ADC	74-03-06	--	--	--	--	--	--
A-18-05 31BCD	74-03-19	--	--	--	--	--	--
A-18-06 08ACD	74-03-06	--	--	--	--	--	--
A-18-07 15CCB2	65-07-23	--	--	--	--	--	--
	72-04-27	<50	--	--	--	--	--
A-18-07 15CCB3	65-07-23	--	--	--	--	--	--
A-18-07 15CCC1	66-05-18	--	--	--	--	--	--
A-18-07 15CCC2	77-10-31	--	8	--	--	--	--
A-18-07 15CCC3	75-01-08	--	--	--	--	--	--
A-18-07 27CBB	65-09-07	--	--	--	--	--	--
A-18-09 28DBD	71-09-23	--	10	--	--	--	--
A-18-09 29CAA	67-11-15	--	--	--	--	--	--
A-19-01 33BBD	77-06-07	--	0	--	--	--	--
A-19-06 15DDD1	46-06-10	--	--	--	--	--	--
A-19-06 15DDD2	49-07-31	--	--	--	--	--	--
A-19-06 27BBCC	46-06-10	--	--	--	--	--	--
	49-08-17	--	--	--	--	--	--

LOCAL IDENT-I-FIER	SITE	GEO-LOGIC UNIT	DATE OF SAMPLE	AGENCY ANA-LYZING SAMPLE (CODE NUMBER)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)
A-19-06 27WD UNSURV	SP	--	74-03-06	1028	471	7.7	11.5	260	6	61
A-20-07 28BCC	GW	310CCNN	78-04-18	1028	440	7.7	--	200	1	43
A-20-07 30BBB	GW	310CCNN	78-04-12	1028	440	7.6	11.5	200	0	43
A-20-08 18BCC	GW	310CCNN	70-04-16	1028	659	7.8	--	340	0	51
	GW	310CCNN	70-06-02	1028	578	8.0	--	330	55	46
A-20-08 18CAC	GW	310CCNN	78-04-14	1028	400	7.7	11.0	190	0	39
A-20-08 19ABA	GW	310CCNN	77-11-17	1028	270	7.8	10.5	160	8	31
A-21-02 30CAC	SP	120VLCC	76-09-30	1028	170	6.6	11.0	71	0	16
A-21-02 30DAB	SP	120VLCC	76-09-30	1028	140	6.6	15.0	59	0	13
B-18-01 06ABB	GW	341MRIN	77-05-05	1028	650	7.5	18.0	280	110	69

Table 13.--Chemical analysis of water from selected wells and springs in the upper Verde River area—Continued

LOCAL IDENT-I-FIER	DATE OF SAMPLE	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	SODIUM+POTAS-SIUM DIS-SOLVED (MG/L AS NA)	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)
A-19-06 27WD UNSURV	74-03-06	26	2.9	.1	--	1.0	309	0	1.5	3.0
A-20-07 28BCC	78-04-18	22	3.6	.1	--	.5	240	0	1.8	5.3
A-20-07 30BBB	78-04-12	22	4.2	.1	--	.7	250	0	3.0	2.1
A-20-08 18BCC	70-04-16	52	--	--	18	--	450	0	1.0	5.5
	70-06-02	52	5.3	.1	--	4.0	398	0	1.0	4.0
A-20-08 18CAC	78-04-14	25	4.0	.1	--	.5	240	0	3.0	4.7
A-20-08 19ABA	77-11-17	19	2.3	.1	--	.4	180	0	3.6	1.1
A-21-02 30CAC	76-09-30	7.5	7.9	.4	--	2.9	92	0	12	3.9
A-21-02 30DAB	76-09-30	6.5	5.8	.3	--	4.1	73	0	8.9	3.8
B-18-01 06ABB	77-05-05	27	14	.4	--	1.1	210	0	35	43

LOCAL IDENT-I-FIER	DATE OF SAMPLE	FLUORIDE, DIS-SOLVED (MG/L AS F)	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NITRATE DIS-SOLVED (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)	PHOS-PHATE, ORTHO, DIS-SOLVED (MG/L AS PO4)
A-19-06 27WD UNSURV	74-03-06	.5	10	248	259	.34	.18	.18	--	.09
A-20-07 28BCC	78-04-18	.1	14	--	211	.29	--	.52	.00	.00
A-20-07 30BBB	78-04-12	.1	12	--	217	.30	--	1.4	.01	.03
A-20-08 18BCC	70-04-16	.1	10	--	360	--	--	--	--	--
	70-06-02	.1	11	--	316	--	--	--	--	--
A-20-08 18CAC	78-04-14	.1	9.9	--	204	.28	--	--	.00	.00
A-20-08 19ABA	77-11-17	.1	8.2	--	156	.21	--	.34	.01	.03
A-21-02 30CAC	76-09-30	.1	47	147	143	.20	--	.00	.05	.15
A-21-02 30DAB	76-09-30	.1	53	122	111	.17	--	.01	.00	.00
B-18-01 06ABB	77-05-05	.1	17	--	363	--	--	12	.04	.12

Table 13.--Chemical analysis of water from selected wells and springs in the upper Verde River area—Continued

LOCAL IDENT-I-FIER	DATE OF SAMPLE	ARSENIC TOTAL (UG/L AS AS)	ARSENIC DIS-SOLVED (UG/L AS AS)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
A-19-06 27WD UNSURV	74-03-06	--	--	10	--	--	--	--	10	--
A-20-07 28BCC	78-04-18	--	6	9	--	--	--	--	20	--
A-20-07 30BBB	78-04-12	--	3	6	--	--	--	--	10	--
A-20-08 18BCC	70-04-16	--	--	--	--	--	--	--	--	--
	70-06-02	--	--	--	--	--	--	--	--	--
A-20-08 18CAC	78-04-14	--	4	2	--	--	--	--	10	--
A-20-08 19ABA	77-11-17	--	5	10	--	--	--	--	10	--
A-21-02 30CAC	76-09-30	--	--	20	--	--	--	--	10	--
A-21-02 30DAB	76-09-30	--	--	50	--	--	--	--	180	--
B-18-01 06ABB	77-05-05	--	--	30	--	--	--	--	20	--

LOCAL IDENT- I- FIER	DATE OF SAMPLE	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	SELE- NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV- ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)
A-19-06 27WD UNSURV	74-03-06	--	--	--	--	--	--
A-20-07 28BCC	78-04-18	--	0	--	--	--	--
A-20-07 30BBB	78-04-12	--	0	--	--	--	--
A-20-08 18BCC	70-04-16	--	--	--	--	--	--
	70-06-02	--	--	--	--	--	--
A-20-08 18CAC	78-04-14	--	0	--	--	--	--
A-20-08 19ABA	77-11-17	--	4	--	--	--	--
A-21-02 30CAC	76-09-30	--	--	--	--	--	--
A-21-02 30DAB	76-09-30	--	--	--	--	--	--
B-18-01 06ABB	77-05-05	--	0	--	--	--	--

Streamflow, instantaneous: E, estimated.
Coliform, fecal: B, non-ideal colony count prior to 1978 water year; K, non-ideal colony count since October 1978; <1, value is known to be less than the value shown.

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (JTU)	OXYGEN, DIS-SOLVED (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)
345203112240500 - VERDE RIVER AT STEWART RANCH (LAT 34 52 03 LONG 112 24 05)										
APR , 1977										
26...	1200	20	575	8.3	23.0	--	--	--	210	0
09503700 - VERDE RIVER NEAR PAULDEN, ARIZ. (LAT 34 53 42 LONG 112 20 26)										
APR , 1977										
26...	1310	29	600	8.3	21.5	--	--	--	200	0
JUN										
22...	1130	21	630	8.2	22.5	8	10.9	220	220	0
MAR , 1978										
01...	1745	7520	140	7.9	9.0	--	--	--	88	0
345352112120400 - VERDE RIVER NR PERKINSVILLE (LAT 34 53 52 LONG 112 12 04)										
APR , 1977										
26...	1530	18	575	8.6	22.0	--	--	--	190	0

DATE	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
345203112240500 - VERDE RIVER AT STEWART RANCH (LAT 34 52 03 LONG 112 24 05)										
APR , 1977										
26...	46	22	51	1.5	3.3	330	0	18	22	.7
09503700 - VERDE RIVER NEAR PAULDEN, ARIZ. (LAT 34 53 42 LONG 112 20 26)										
APR , 1977										
26...	42	23	54	1.7	3.2	320	0	19	22	.6
JUN										
22...	49	24	56	1.6	3.3	330	0	20	23	.6
MAR , 1978										
01...	27	5.1	5.6	.3	3.4	110	0	6.1	3.0	.3
345352112120400 - VERDE RIVER NR PERKINSVILLE (LAT 34 53 52 LONG 112 12 04)										
APR , 1977										
26...	35	26	54	1.7	3.5	300	0	19	23	.6

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)
345203112240500 - VERDE RIVER AT STEWART RANCH (LAT 34 52 03 LONG 112 24 05)										
APR , 1977										
26...	37	339	367	.46	--	.96	--	--	--	.01
09503700 - VERDE RIVER NEAR PAULDEN, ARIZ. (LAT 34 53 42 LONG 112 20 26)										
APR , 1977										
26...	32	323	357	.44	--	.75	--	--	--	.01
JUN										
22...	35	351	377	.48	.62	.67	.33	.95	.030	.01
MAR , 1978										
01...	.2	102	105	.14	--	--	--	--	--	--
345352112120400 - VERDE RIVER NR PERKINSVILLE (LAT 34 53 52 LONG 112 12 04)										
APR , 1977										
26...	28	307	339	.42	--	.38	--	--	--	.02

DATE	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA)	BORON, TOTAL RECOV-ERABLE (UG/L AS B)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
345203112240500 - VERDE RIVER AT STEWART RANCH (LAT 34 52 03 LONG 112 24 05)										
APR , 1977										
26...	--	--	--	210	--	--	--	--	10	--
09503700 - VERDE RIVER NEAR PAULDEN, ARIZ. (LAT 34 53 42 LONG 112 20 26)										
APR , 1977										
26...	--	--	--	230	--	--	--	--	10	--
JUN										
22...	26	0	280	230	<10	10	<10	200	30	<100
MAR , 1978										
01...	--	--	--	50	--	--	--	--	60	--
345352112120400 - VERDE RIVER NR PERKINSVILLE (LAT 34 53 52 LONG 112 12 04)										
APR , 1977										
26...	--	--	--	230	--	--	--	--	50	--

DATE	MANGA-NESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGA-NESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	SELE-NIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS (UG/L)
345203112240500 - VERDE RIVER AT STEWART RANCH (LAT 34 52 03 LONG 112 24 05)									
APR , 1977									
26...	--	--	--	--	--	--	--	--	--
09503700 - VERDE RIVER NEAR PAULDEN, ARIZ. (LAT 34 53 42 LONG 112 20 26)									
APR , 1977									
26...	--	--	--	--	--	--	--	--	--
JUN									
22...	8	8	.3	3	<10	30	1.1	.00	4
MAR , 1978									
01...	--	--	--	--	--	--	--	--	--
345352112120400 - VERDE RIVER NR PERKINSVILLE (LAT 34 53 52 LONG 112 12 04)									
APR , 1977									
26...	--	--	--	--	--	--	--	--	--

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (JTU)	OXYGEN, DIS-SOLVED (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)
					09504000 - VERDE RIVER NR CLARKDALE, ARIZ. (LAT 34 51 05 LONG 112 03 55)					
MAR , 1976										
24...	1230	79	485	8.0	17.0	10	9.2	--	230	0
APR										
20...	1230	1000	130	7.9	14.0	46	7.9	--	61	0
MAY										
24...	1300	74	545	8.0	22.0	35	8.0	--	240	0
JUN										
29...	1230	72	490	8.1	25.0	2	8.8	--	220	0
JUL										
29...	1300	76	540	8.2	27.0	35	--	--	210	0
AUG										
31...	1400	76	470	8.2	24.5	10	8.9	--	210	0
SEP										
30...	1330	76	475	8.2	21.5	20	--	--	220	31
NOV										
10...	1300	77	510	8.1	15.0	10	10.0	B8	230	0
DEC										
09...	1400	80	510	8.2	11.0	4	10.6	B2	230	41
JAN , 1977										
12...	1430	81	500	8.3	10.0	2	10.8	B1	240	0
FEB										
23...	1300	81	505	8.3	11.5	8	--	<1	240	0
MAR										
22...	1230	82	490	8.2	16.0	10	--	<1	230	0
APR										
26...	1400	80	620	8.1	22.0	9	8.4	B4	230	0
MAY										
24...	1400	80	490	8.2	14.5	6	7.5	43	240	0
JUN										
20...	1700	73	490	8.2	24.5	9	9.8	B10	220	0
JUL										
21...	1400	77	550	8.3	23.5	25	--	30	230	0
AUG										
19...	1100	74	495	8.1	22.5	98	7.4	370	240	0
SEP										
28...	1430	79	480	8.1	23.5	30	--	44	220	0
OCT										
27...	1000	76	490	8.0	14.5	15	9.0	36	240	0
NOV , 1977										
29...	1400	76	500	8.2	12.5	3	10.6	K11	240	0
DEC										
21...	1600	73	490	8.4	10.5	2	10.0	K2	190	6
JAN , 1978										
25...	1400	77	495	8.1	11.5	5	10.3	K1	240	0
FEB										
24...	1400	337	193	7.7	10.0	25	11.6	K11	92	2
MAR										
18...	1500	578	240	7.8	13.0	40	8.9	K2	100	4
APR										
26...	1300	82	500	8.1	20.0	1	8.9	K13	240	0
MAY										
10...	1800	68	495	8.2	21.0	--	8.3	K13	240	0
JUN										
13...	1330	65	490	8.0	25.0	--	--	K3	210	0
JUL										
10...	1300	63	456	8.3	25.0	--	9.6	K10	210	0
AUG										
08...	1200	70	490	8.3	25.5	70	7.0	78	230	0
SEP										
11...	1500	58	475	8.2	24.0	--	--	61	220	0
OCT										
11...	0910	67	510	8.1	16.0	--	--	K16	210	0
NOV										
14...	1100	149	230	7.5	9.0	160	11.6	K900	110	6
DEC										
12...	1100	71	490	8.2	7.0	0	10.8	20	240	0
JAN , 1979										
16...	1115	78	495	--	11.0	--	10.2	20	220	0
FEB										
14...	1530	486	250	8.2	10.0	--	9.6	K12	110	0
MAR										
13...	1600	1130	130	7.6	10.0	--	9.7	K1	60	4
APR										
18...	0945	131	360	8.2	14.0	--	9.4	K6	170	0
MAY										
09...	1730	80	470	8.3	17.0	--	10.4	K4	230	0
JUN , 1979										
11...	1600	80	510	8.0	26.0	--	7.2	K3	220	0
JUL										
12...	0945	76	480	7.9	20.0	--	10.4	24	200	0
AUG										
09...	1700	72	480	8.5	28.5	30	7.2	58	210	0
SEP										
28...	1345	74	520	8.3	22.0	--	9.4	K12	220	0

DATE	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
			09504000 - VERDE RIVER NR CLARKDALE, ARIZ. (LAT 34 51 05 LONG 112 03 55)							
MAR , 1976										
24...	56	23	19	.5	2.0	295	0	8.1	14	.2
APR										
20...	16	5.0	4.7	.3	1.4	85	0	4.8	2.2	.1
MAY										
24...	55	24	22	.6	2.2	305	0	11	13	.3
JUN										
29...	49	24	23	.7	2.0	299	0	9.1	13	.3
JUL										
29...	49	21	23	.7	2.3	315	0	9.1	15	.3
AUG										
31...	46	24	25	.7	2.2	292	0	9.6	15	.3
SEP										
30...	52	23	25	.7	2.3	236	0	8.5	14	.3
NOV										
10...	51	24	25	.7	2.1	288	0	8.7	16	.2
DEC										
09...	54	24	25	.7	2.0	235	0	9.8	13	.3
JAN , 1977										
12...	55	24	24	.7	2.0	307	0	11	14	.2
FEB										
23...	54	25	25	.7	2.1	316	0	11	15	.2
MAR										
22...	54	24	25	.7	2.0	310	0	12	14	.2
APR										
26...	52	24	25	.7	2.2	310	0	11	13	.3
MAY										
24...	56	24	24	.7	2.0	310	0	9.5	15	.2
JUN										
20...	49	24	25	.7	2.2	280	0	9.3	15	.2
JUL										
21...	53	23	27	.8	2.2	310	0	7.3	13	.2
AUG										
19...	58	23	25	.7	2.4	310	0	7.1	16	.2
SEP										
28...	50	24	26	.8	2.4	290	0	9.7	11	.2
OCT										
27...	53	26	24	.7	2.0	310	0	6.7	13	.3
NOV , 1977										
29...	54	25	26	.7	2.0	310	0	9.1	15	.3
DEC										
21...	43	20	7.0	.2	1.1	220	2	7.2	7.7	.1
JAN , 1978										
25...	54	25	24	.7	2.1	310	0	9.0	11	.2
FEB										
24...	23	8.5	6.7	.3	1.1	110	--	6.8	4.6	.1
MAR										
18...	26	9.1	8.8	.4	1.7	120	0	7.9	4.8	.1
APR										
26...	56	24	20	.6	2.1	310	0	9.1	13	.2
MAY										
10...	55	24	21	.6	2.5	310	0	10	13	.2
JUN										
13...	44	24	19	.6	1.7	290	0	9.7	12	.2
JUL										
10...	43	24	22	.7	2.2	260	0	9.0	14	.2
AUG										
08...	53	24	23	.7	2.5	300	1	8.1	12	.2
SEP										
11...	52	23	21	.6	2.2	280	0	10	14	.2
OCT										
11...	48	23	22	.7	2.0	300	0	11	13	.3
NOV										
14...	30	9.2	9.9	.4	2.9	130	0	8.3	15	.1
DEC										
12...	55	24	23	.7	2.1	310	0	9.6	13	.2
JAN , 1979										
16...	51	22	22	.6	2.4	310	--	10	9.8	.2
FEB										
14...	29	9.8	12	.5	1.3	150	0	13	6.1	.2
MAR										
13...	15	5.5	5.1	.3	1.0	69	0	4.6	2.5	.1
APR										
18...	41	17	16	.5	1.7	210	0	7.0	8.1	.2
MAY										
09...	56	23	23	.7	2.3	300	0	12	10	.2
JUN , 1979										
11...	49	23	24	.7	2.4	290	0	11	11	.2
JUL										
12...	44	22	21	.6	2.4	300	0	12	13	.2
AUG										
09...	46	22	22	.7	2.9	280	0	12	18	.2
SEP										
28...	48	24	26	.8	2.1	--	--	13	16	.2

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)
09504000 - VERDE RIVER NR CLARKDALE, ARIZ. (LAT 34 51 05 LONG 112 03 55)										
MAR , 1976										
24...	16	272	284	.37	.10	.08	.22	.32	.000	.01
APR										
20...	14	115	92	.16	.16	.15	1.5	1.7	.230	.04
MAY										
24...	20	288	298	.39	.24	--	.31	.55	.120	--
JUN										
29...	19	274	287	.37	.03	.05	.06	.09	.040	.00
JUL										
29...	20	211	296	.29	.26	.30	.25	.51	.170	.03
AUG										
31...	19	285	295	.39	.36	2.3	.20	.56	.020	.02
SEP										
30...	20	285	264	.39	.59	.46	.75	1.3	.110	.01
NOV										
10...	20	276	290	.38	--	.14	--	--	--	.02
DEC										
09...	18	271	263	.37	.26	.21	.15	.41	.020	.02
JAN , 1977										
12...	19	298	302	.41	.28	.29	.07	.35	.000	.04
FEB										
23...	19	296	308	.40	.17	.16	.06	.23	.290	.02
MAR										
22...	17	295	302	.40	.08	.08	.18	.26	.070	.02
APR										
26...	18	279	299	.38	.15	.14	.15	.30	.040	.08
MAY										
24...	18	289	303	.39	.09	.27	.32	.41	.020	.03
JUN										
20...	19	271	282	.37	.28	.04	.19	.47	.040	.01
JUL										
21...	20	282	300	.38	.17	.25	.31	.48	.070	.03
AUG										
19...	22	298	309	.41	.42	.43	.42	.84	.260	.04
SEP										
28...	23	250	290	.34	.15	.20	.05	.20	.060	.01
OCT										
27...	20	288	299	.39	.12	.20	.19	.31	.030	.01
NOV , 1977										
29...	20	286	305	.39	.25	.17	.04	.29	.000	.01
DEC										
21...	16	198	213	.27	.08	.08	--	.09	.100	.00
JAN , 1978										
25...	20	284	300	.39	.20	.28	.05	.25	.040	.01
FEB										
24...	15	124	120	.17	.11	.01	.08	.19	.110	.01
MAR										
18...	17	126	136	.17	.23	.24	.25	.48	.200	.08
APR										
26...	15	260	293	.35	.04	.06	.17	.21	.020	.01
MAY										
10...	17	266	296	.36	.05	.04	.20	.25	.030	.01
JUN										
13...	17	--	271	.37	.01	.04	.25	.26	.010	.01
JUL										
10...	17	--	260	.35	.01	.03	.53	.54	.000	.02
AUG										
08...	21	273	294	.37	.25	.23	.58	.83	.120	.03
SEP										
11...	18	--	279	.38	.02	.05	.34	.36	.030	.01
OCT										
11...	19	--	287	.39	.05	.09	.17	.22	.020	.01
NOV										
14...	14	170	156	.23	.32	.40	.81	1.1	.430	.09
DEC										
12...	18	273	299	.37	.14	.19	.03	.17	.020	.00
JAN , 1979										
16...	17	--	288	.39	.14	.11	.11	.25	.020	.00
FEB										
14...	17	--	164	.22	.20	.29	.30	.50	.070	.03
MAR										
13...	14	--	82	.11	.05	.04	.30	.35	.080	.04
APR										
18...	18	--	213	.29	.02	.06	.14	.16	.020	.01
MAY										
09...	15	--	290	.39	.01	.02	.26	.27	.010	.01
JUN , 1979										
11...	17	--	281	.38	.03	.14	.30	.33	.040	.00
JUL										
12...	18	263	281	.36	.02	.02	.19	.21	.010	.00
AUG										
09...	19	271	281	.37	.04	.08	.12	.16	.040	.01
SEP										
28...	20	--	288	.39	.04	.03	.40	.44	.030	.01

DATE	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA)	BORON, TOTAL RECOV-ERABLE (UG/L AS B)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
09504000 - VERDE RIVER NR CLARKDALE, ARIZ. (LAT 34 51 05 LONG 112 03 55)										
MAR , 1976										
24...	13	100	240	140	<10	0	<10	80	10	<100
APR										
20...	6	100	360	50	<10	0	10	3800	110	<100
MAY										
24...	16	0	170	120	<10	10	<10	1800	0	<100
JUN										
29...	19	100	110	110	<10	20	<10	--	20	<100
JUL										
29...	7	100	170	90	<10	0	10	730	40	<100
AUG										
31...	17	200	200	160	<10	10	10	530	20	<100
SEP										
30...	15	200	200	160	<10	10	10	1300	10	<100
NOV										
10...	17	200	200	150	<10	0	<10	460	20	100
DEC										
09...	19	200	210	160	<10	10	10	170	20	<100
JAN , 1977										
12...	15	200	190	160	<10	0	10	170	20	<100
FEB										
23...	20	200	200	160	<10	0	<10	300	20	<100
MAR										
22...	16	200	210	160	<10	0	10	400	20	100
APR										
26...	18	100	190	160	10	10	10	220	30	<100
MAY										
24...	17	200	180	150	<10	0	<10	230	50	<100
JUN										
20...	12	300	200	160	<10	10	<10	230	30	<100
JUL										
21...	15	300	240	160	<10	10	10	920	20	<100
AUG										
19...	15	400	240	160	10	10	30	2900	30	<100
SEP										
28...	18	300	190	160	<10	0	<10	1200	20	<100
OCT										
27...	21	200	190	170	<10	5	<10	410	40	<100
NOV , 1977										
29...	20	400	210	170	1	0	8	200	40	6
DEC										
21...	6	100	50	20	1	--	43	130	60	4
JAN , 1978										
25...	18	200	170	150	1	10	5	210	0	2
FEB										
24...	5	100	130	50	0	10	7	1400	250	6
MAR										
18...	6	100	110	60	2	20	5	1700	10	5
APR										
26...	15	400	200	160	1	0	10	80	40	5
MAY										
10...	16	300	310	160	1	0	10	230	20	7
JUN										
13...	14	100	190	150	5	10	26	140	0	5
JUL										
10...	18	400	190	160	2	10	9	50	40	16
AUG										
08...	15	300	200	160	3	10	15	1700	<10	21
SEP										
11...	16	400	180	190	11	0	11	300	10	76
OCT										
11...	16	100	250	190	0	0	7	270	10	2
NOV										
14...	8	200	160	70	6	10	17	7700	60	39
DEC										
12...	16	200	190	160	4	20	3	50	0	22
JAN , 1979										
16...	15	200	190	190	--	0	4	30	0	--
FEB										
14...	7	100	120	70	3	0	8	2400	10	44
MAR										
13...	3	0	90	40	1	10	12	1100	70	83
APR										
18...	14	100	150	170	0	0	8	130	0	30
MAY										
09...	16	200	300	190	7	0	2	90	10	97
JUN , 1979										
11...	14	200	190	170	1	0	2	80	10	12
JUL										
12...	13	200	190	170	0	0	4	50	10	12
AUG										
09...	14	200	50	170	0	10	9	730	<10	5
SEP										
28...	18	100	200	170	0	0	8	170	<10	1

DATE	MANGANESE, TOTAL RECOV-ERABLE (UG/L AS MN)	MANGANESE, DIS-SOLVED (UG/L AS MN)	MERCURY TOTAL RECOV-ERABLE (UG/L AS HG)	SELENIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOV-ERABLE (UG/L AS AG)	ZINC, TOTAL RECOV-ERABLE (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS (UG/L)
09504000 - VERDE RIVER NR CLARKDALE, ARIZ. (LAT 34 51 05 LONG 112 03 55)									
MAR , 1976									
24...	20	20	.0	0	<10	0	2.4	.00	0
APR									
20...	140	960	.0	1	<10	20	11	.00	4
MAY									
24...	60	30	.1	--	<10	10	1.8	.00	1
JUN									
29...	20	10	.3	0	<10	60	5.0	.00	0
JUL									
29...	50	20	.4	0	<10	10	--	.00	8
AUG									
31...	50	10	.0	0	<10	70	3.4	.00	2
SEP									
30...	60	20	.0	0	<10	20	1.1	.02	1
NOV									
10...	40	20	.0	1	<10	0	.9	.00	0
DEC									
09...	10	0	.0	0	<10	20	.7	.00	0
JAN , 1977									
12...	20	10	.2	0	<10	10	.7	.00	0
FEB									
23...	30	20	.0	1	<10	10	.8	.00	1
MAR									
22...	20	0	.0	1	<10	40	1.3	.00	2
APR									
26...	20	10	.3	0	<10	20	1.7	.00	2
MAY									
24...	20	20	.0	0	<10	20	2.7	.00	--
JUN									
20...	20	4	.3	1	<10	30	1.3	.00	3
JUL									
21...	40	20	.0	0	<10	30	1.0	.00	2
AUG									
19...	180	10	.1	0	<10	50	4.4	.00	2
SEP									
28...	40	0	.0	0	<10	20	1.4	.00	5
OCT									
27...	30	20	.0	0	<10	30	.7	.00	0
NOV , 1977									
29...	20	8	.0	0	0	20	2.0	.00	1
DEC									
21...	10	10	.0	0	0	20	1.7	.00	3
JAN , 1978									
25...	20	10	.1	0	0	30	.7	.00	3
FEB									
24...	30	10	.0	1	0	30	5.3	.00	1
MAR									
18...	40	0	.0	9	1	10	5.4	.00	0
APR									
26...	20	0	.0	0	0	40	.9	.00	0
MAY									
10...	20	0	.0	0	0	40	1.6	.00	0
JUN									
13...	30	0	.0	0	0	50	1.1	.00	0
JUL									
10...	10	10	.0	0	0	20	1.7	.00	3
AUG									
08...	90	5	.1	0	0	30	5.0	.00	1
SEP									
11...	20	10	.0	0	0	20	1.4	.00	1
OCT									
11...	40	10	.0	0	0	10	2.4	.00	2
NOV									
14...	200	10	.0	1	0	40	13	.00	3
DEC									
12...	10	6	.0	1	0	20	.7	.00	0
JAN , 1979									
16...	0	7	.0	0	1	10	.9	.00	3
FEB									
14...	60	10	.0	0	1	20	4.3	.00	1
MAR									
13...	10	10	--	0	0	30	4.6	.00	0
APR									
18...	10	3	.1	0	0	30	--	.00	1
MAY									
09...	20	10	.1	1	0	40	--	.00	1
JUN , 1979									
11...	10	10	.0	0	0	30	1.2	.00	0
JUL									
12...	0	3	.1	0	0	20	.2	.00	2
AUG									
09...	40	3	.1	0	0	20	1.3	.00	2
SEP									
28...	10	8	.1	0	0	10	--	.00	4

DATE	TIME	STREAM-FLOW, INSTANTANEOUS (CFS)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE (DEG C)	TURBIDITY (JTU)	OXYGEN, DISSOLVED (MG/L)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)
344618112023700 - VERDE R. AT OLD BRIDGE SITE AT CLARKDALE,AZ. (LAT 34 46 18 LONG 112 02 37)										
JUN , 1979										
12...	1100	73	599	8.1	23.0	--	8.3	--	250	18
344557112014600 - VERDE RIVER AT TUZIGOOT BRIDGE NR CLARKDALE,ARIZ (LAT 34 45 57 LONG 112 01 46)										
JUN , 1977										
21...	1500	46	520	8.4	24.0	25	7.9	78	230	0
344557112011600 - TAVASCI MARSH WASH @ MOUTH NR CLARKDALE,AZ (LAT 34 45 57 LONG 112 01 16)										
JUN , 1979										
12...	0800	2.5	608	7.7	17.5	--	--	--	280	0
344318111592400 - VERDE RIVER AT HIGHWAY 89A NR COTTONWOOD,ARIZ (LAT 34 43 18 LONG 111 59 24)										
JUN , 1977										
22...	1000	32	560	8.0	21.0	45	8.6	730	280	9
344228111584300 - VERDE R. BEL END OF CTTNWD. DITCH NR CTTNWD,AZ. (LAT 34 42 28 LONG 111 58 43)										
JUN , 1979										
12...	0900	67	655	8.2	22.0	--	--	--	300	39

DATE	CALCIUM DISSOLVED (MG/L AS CA)	MAGNESIUM, DISSOLVED (MG/L AS MG)	SODIUM, DISSOLVED (MG/L AS NA)	SODIUM ADSORPTION RATIO	POTASSIUM, DISSOLVED (MG/L AS K)	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)
344618112023700 - VERDE R. AT OLD BRIDGE SITE AT CLARKDALE,AZ. (LAT 34 46 18 LONG 112 02 37)										
JUN , 1979										
12...	53	28	24	.7	2.5	280	0	42	14	.2
344557112014600 - VERDE RIVER AT TUZIGOOT BRIDGE NR CLARKDALE,ARIZ (LAT 34 45 57 LONG 112 01 46)										
JUN , 1977										
21...	48	26	26	.8	2.3	290	0	23	21	.2
344557112011600 - TAVASCI MARSH WASH @ MOUTH NR CLARKDALE,AZ (LAT 34 45 57 LONG 112 01 16)										
JUN , 1979										
12...	58	34	26	.7	3.5	360	0	13	19	.3
344318111592400 - VERDE RIVER AT HIGHWAY 89A NR COTTONWOOD,ARIZ (LAT 34 43 18 LONG 111 59 24)										
JUN , 1977										
22...	56	34	28	.7	2.9	330	0	43	19	.2
344228111584300 - VERDE R. BEL END OF CTTNWD. DITCH NR CTTNWD,AZ. (LAT 34 42 28 LONG 111 58 43)										
JUN , 1979										
12...	63	35	27	.7	2.7	320	0	68	15	.2

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area--Continued

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)
344618112023700 - VERDE R. AT OLD BRIDGE SITE AT CLARKDALE,AZ. (LAT 34 46 18 LONG 112 02 37)										
JUN , 1979										
12...	16	319	319	.43	--	.21	--	--	--	--
344557112014600 - VERDE RIVER AT TUZIGOOT BRIDGE NR CLARKDALE,ARIZ (LAT 34 45 57 LONG 112 01 46)										
JUN , 1977										
21...	20	287	310	.39	.01	.02	.16	.17	.110	.01
344557112011600 - TAVASCI MARSH WASH @ MOUTH NR CLARKDALE,AZ (LAT 34 45 57 LONG 112 01 16)										
JUN , 1979										
12...	18	358	371	.49	--	4.9	--	--	--	--
344318111592400 - VERDE RIVER AT HIGHWAY 89A NR COTTONWOOD,ARIZ (LAT 34 43 18 LONG 111 59 24)										
JUN , 1977										
22...	23	362	370	.49	.08	.10	.35	.43	.140	.02
344228111584300 - VERDE R. BEL END OF CTTNWD. DITCH NR CTTNWD,AZ. (LAT 34 42 28 LONG 111 58 43)										
JUN , 1979										
12...	20	367	389	.50	--	.11	--	--	--	--

DATE	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA)	BORON, TOTAL RECOV-ERABLE (UG/L AS B)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
344618112023700 - VERDE R. AT OLD BRIDGE SITE AT CLARKDALE,AZ. (LAT 34 46 18 LONG 112 02 37)										
JUN , 1979										
12...	--	--	--	170	1	--	--	--	10	11
344557112014600 - VERDE RIVER AT TUZIGOOT BRIDGE NR CLARKDALE,ARIZ (LAT 34 45 57 LONG 112 01 46)										
JUN , 1977										
21...	18	600	200	160	<10	10	10	640	150	<100
344557112011600 - TAVASCI MARSH WASH @ MOUTH NR CLARKDALE,AZ (LAT 34 45 57 LONG 112 01 16)										
JUN , 1979										
12...	--	--	--	160	--	--	--	--	40	--
344318111592400 - VERDE RIVER AT HIGHWAY 89A NR COTTONWOOD,ARIZ (LAT 34 43 18 LONG 111 59 24)										
JUN , 1977										
22...	18	0	210	170	<10	10	30	1800	40	<100
344228111584300 - VERDE R. BEL END OF CTTNWD. DITCH NR CTTNWD,AZ. (LAT 34 42 28 LONG 111 58 43)										
JUN , 1979										
12...	--	--	--	130	--	--	--	--	10	--

DATE	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	SELENIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOVERABLE (UG/L AS AG)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS (UG/L)
344618112023700 - VERDE R. AT OLD BRIDGE SITE AT CLARKDALE,AZ. (LAT 34 46 18 LONG 112 02 37)									
JUN , 1979									
12...	--	--	--	--	--	--	--	--	--
344557112014600 - VERDE RIVER AT TUZIGOOT BRIDGE NR CLARKDALE,ARIZ (LAT 34 45 57 LONG 112 01 46)									
JUN , 1977									
21...	50	10	.0	2	<10	50	2.1	.00	3
344557112011600 - TAVASCI MARSH WASH @ MOUTH NR CLARKDALE,AZ (LAT 34 45 57 LONG 112 01 16)									
JUN , 1979									
12...	--	--	--	--	--	--	--	--	--
344318111592400 - VERDE RIVER AT HIGHWAY 89A NR COTTONWOOD,ARIZ (LAT 34 43 18 LONG 111 59 24)									
JUN , 1977									
22...	110	20	.4	2	<10	80	5.4	.00	3
344228111584300 - VERDE R. BEL END OF CTTNWD. DITCH NR CTTNWD,AZ. (LAT 34 42 28 LONG 111 58 43)									
JUN , 1979									
12...	--	--	--	--	--	--	--	--	--

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (JTU)	OXYGEN, DIS-SOLVED (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./ 100 ML)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)
09504200 - VERDE R NR CORNVILLE, ARIZ. (LAT 34 40 58 LONG 111 57 28)										
NOV , 1976										
04...	1230	69	590	8.1	15.0	10	11.0	B28	270	0
DEC										
10...	0930	85	565	8.4	6.0	10	10.4	21	280	10
JAN , 1977										
14...	1200	86	440	8.2	6.0	10	10.2	B6	260	0
FEB										
24...	1230	74	560	7.8	9.5	9	10.8	140	270	0
MAR										
23...	1100	65	560	8.2	14.0	15	10.0	B11	280	6
APR										
27...	1300	53	590	8.3	21.0	20	9.4	60	280	8
MAY										
25...	1130	73	600	8.3	15.5	45	8.8	45	280	89
JUN										
21...	1200	43	600	8.1	21.0	30	8.1	80	290	8
JUL										
22...	1200	61	560	8.3	23.0	85	7.1	180	250	0
AUG										
18...	1130	94	570	8.0	26.0	240	8.7	1600	270	0
SEP										
29...	1200	79	560	8.1	23.0	75	--	B330	270	9
OCT										
26...	1100	72	550	8.3	15.0	30	10.4	80	270	8
NOV										
30...	1000	64	560	8.2	9.0	9	9.4	32	290	13
DEC										
22...	1000	77	560	8.1	7.5	9	10.4	32	280	13
JAN , 1978										
26...	1000	84	560	8.4	6.5	25	10.2	26	270	0
FEB										
27...	1300	270	268	7.7	10.5	40	10.4	K230	140	12
MAR										
22...	1000	E750	260	8.0	13.0	150	8.8	410	120	13
APR										
27...	0900	61	610	8.1	18.0	3	9.8	K14	290	32
MAY										
11...	0830	44	630	8.1	17.5	--	8.1	49	310	36
JUN , 1978										
14...	1400	44	580	8.0	26.0	--	--	K30	290	40
JUL										
11...	1230	53	490	8.1	25.0	--	8.2	K160	310	44
AUG										
09...	0900	47	610	8.2	27.0	70	--	490	270	0
SEP										
12...	1300	48	600	8.6	25.0	--	6.8	220	280	7
344041111571000 - VERDE R. 1.3 MI. AB OAK CK NR CORNVILLE,AZ. (LAT 34 40 41 LONG 111 57 10)										
JUN , 1979										
12...	1100	75	550	8.0	24.5	--	--	--	280	34
345954111441800 - OAK CREEK AT CAVE SPRINGS CAMPGROUND NR SEDONA (LAT 34 59 54 LONG 111 44 18)										
JUN , 1977										
20...	1030	4.2	270	8.3	13.0	1	12.7	B8	150	3
345536111440100 - OAK CREEK AT ENCINOSO CAMP GROUNDS (LAT 34 55 36 LONG 111 44 01)										
JAN , 1975										
20...	0940	13	330	8.3	4.0	--	--	--	170	0
345436111434000 - OAK CREEK BELOW INDIAN GARDENS (LAT 34 53 36 LONG 111 43 40)										
JAN , 1975										
20...	1045	35	298	8.3	8.5	--	--	--	150	0
JUN , 1977										
20...	1130	30	280	8.4	15.0	1	9.4	B6	150	0

DATE	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
09504200 - VERDE R NR CORNVILLE, ARIZ. (LAT 34 40 58 LONG 111 57 28)										
NOV , 1976										
04...	55	32	28	.7	2.4	333	0	38	17	.3
DEC										
10...	58	32	27	.7	2.2	325	0	38	16	.3
JAN , 1977										
14...	56	30	26	.7	2.1	326	0	37	15	.3
FEB										
24...	57	30	26	.7	2.2	326	0	41	18	.2
MAR										
23...	58	32	26	.7	2.2	330	0	44	16	.3
APR										
27...	57	33	28	.7	2.7	330	0	36	16	.2
MAY										
25...	55	34	28	.7	2.3	230	0	37	18	.4
JUN										
21...	57	35	29	.7	2.7	340	0	39	21	.2
JUL										
22...	53	29	29	.8	2.5	330	0	27	16	.2
AUG										
18...	63	27	27	.7	3.1	340	0	28	17	.3
SEP										
29...	56	32	27	.7	2.9	320	0	34	14	.2
OCT										
26...	54	33	27	.7	2.3	320	0	33	14	.3
NOV										
30...	59	35	28	.7	2.3	340	0	36	17	.2
DEC										
22...	56	33	27	.7	2.2	320	0	36	15	.2
JAN , 1978										
26...	58	31	25	.7	2.3	320	6	35	13	.3
FEB										
27...	31	14	9.6	.4	1.3	150	0	16	6.1	.1
MAR										
22...	28	12	8.3	.3	1.7	130	0	20	5.6	.1
APR										
27...	62	34	26	.7	2.9	320	0	52	16	.2
MAY										
11...	65	37	31	.8	2.9	340	0	63	18	.2
JUN , 1978										
14...	57	37	28	.7	2.5	310	--	46	14	.2
JUL										
11...	60	38	28	.7	3.2	320	0	49	19	.2
AUG										
09...	55	32	30	.8	2.8	340	0	39	16	.2
SEP										
12...	59	32	28	.7	3.5	320	6	37	17	.3
344041111571000 - VERDE R. 1.3 MI. AB OAK CK NR CORNVILLE,AZ. (LAT 34 40 41 LONG 111 57 10)										
JUN , 1979										
12...	56	34	27	.7	2.7	300	0	58	12	.2
345954111441800 - OAK CREEK AT CAVE SPRINGS CAMPGROUND NR SEDONA (LAT 34 59 54 LONG 111 44 18)										
JUN , 1977										
20...	34	16	3.8	.1	.8	180	0	3.6	1.9	.1
345536111440100 - OAK CREEK AT ENCINOSO CAMP GROUNDS (LAT 34 55 36 LONG 111 44 01)										
JAN , 1975										
20...	40	18	3.2	.1	.9	219	--	2.1	2.8	.1
345436111434000 - OAK CREEK BELOW INDIAN GARDENS (LAT 34 53 36 LONG 111 43 40)										
JAN , 1975										
20...	33	16	4.4	.2	1.2	193	--	2.1	3.6	1.1
JUN , 1977										
20...	33	17	5.2	.2	1.0	190	0	2.6	3.0	.1

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	SILICA, DIS- SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS- SOLVED (MG/L)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	SOLIDS, DIS- SOLVED (TONS PER AC-FT)	NITRO- GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN,AM- MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO- GEN, TOTAL (MG/L AS N)	PHOS- PHORUS, TOTAL (MG/L AS P)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)
09504200 - VERDE R NR CORNVILLE, ARIZ. (LAT 34 40 58 LONG 111 57 28)										
NOV , 1976 04...	19	352	356	.48	.01	.01	.57	.58	.760	.02
DEC 10...	18	310	352	.42	.34	.07	.42	.76	.030	.01
JAN , 1977 14...	20	346	348	.47	.22	.18	.45	.67	.070	.04
FEB 24...	19	335	354	.46	.07	.03	.15	.22	.060	.01
MAR 23...	17	349	358	.47	.01	.01	.38	.39	.070	.03
APR 27...	21	352	357	.48	.12	.11	.22	.34	.080	.07
MAY 25...	19	346	308	.47	.07	.07	.33	.40	.060	.04
JUN 21...	23	344	375	.47	.07	.01	.13	.20	.120	.02
JUL 22...	22	337	343	.46	.26	.31	.43	.69	.210	.05
AUG 18...	24	344	360	.47	.72	.65	.79	1.5	.380	.03
SEP 29...	25	335	350	.46	.26	.26	.03	.29	.200	.03
OCT 26...	21	338	343	.46	.05	.07	.18	.23	.070	.01
NOV 30...	20	343	365	.47	.02	.00	.07	.09	.010	.01
DEC 22...	20	341	348	.46	.11	.10	.10	.21	.040	.00
JAN , 1978 26...	21	327	351	.44	.24	.26	.04	.28	.080	.03
FEB 27...	16	165	168	.22	.15	.01	.15	.30	.150	.02
MAR 22...	17	143	158	.19	.27	.30	.36	.63	.430	.04
APR 27...	17	339	369	.46	.20	.15	.41	.61	.040	.01
MAY 11...	18	381	404	.52	.21	.25	.24	.45	.070	.02
JUN , 1978 14...	20	--	358	.49	.04	.05	.38	.42	.010	.01
JUL 11...	20	--	376	.51	.07	.19	.68	.75	.020	.01
AUG 09...	25	357	370	.49	.40	.39	.57	.97	.110	.03
SEP 12...	23	--	365	.50	.13	.23	.54	.67	.130	.02
344041111571000 - VERDE R. 1.3 MI. AB OAK CK NR CORNVILLE,AZ. (LAT 34 40 41 LONG 111 57 10)										
JUN , 1979 12...	19	323	357	.44	--	.00	--	--	--	--
345954111441800 - OAK CREEK AT CAVE SPRINGS CAMPGROUND NR SEDONA (LAT 34 59 54 LONG 111 44 18)										
JUN , 1977 20...	13	163	162	.22	.05	.05	.05	.10	.030	.01
345536111440100 - OAK CREEK AT ENCINOSO CAMP GROUNDS (LAT 34 55 36 LONG 111 44 01)										
JAN , 1975 20...	12	169	187	.23	--	.06	--	--	--	.00
345336111434000 - OAK CREEK BELOW INDIAN GARDENS (LAT 34 53 36 LONG 111 43 40)										
JAN , 1975 20...	15	155	172	.21	--	.08	--	--	--	.00
JUN , 1977 20...	16	155	172	.21	.08	.11	.06	.14	.040	.01

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA)	BORON, TOTAL RECOV-ERABLE (UG/L AS B)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
09504200 - VERDE R NR CORNVILLE, ARIZ. (LAT 34 40 58 LONG 111 57 28)										
NOV , 1976										
04...	16	200	250	170	<10	0	10	580	20	100
DEC										
10...	16	200	220	180	<10	10	10	330	20	<100
JAN , 1977										
14...	15	100	190	160	<10	0	10	510	10	<100
FEB										
24...	18	200	200	160	<10	0	<10	160	20	<100
MAR										
23...	17	200	250	160	<10	0	10	780	30	<100
APR										
27...	16	100	210	170	10	0	10	640	20	100
MAY										
25...	13	200	200	150	<10	10	<10	480	50	<100
JUN										
21...	15	100	210	170	<10	10	10	830	30	<100
JUL										
22...	15	300	260	170	10	10	50	3600	10	100
AUG										
18...	20	400	260	180	10	10	50	4500	70	<100
SEP										
29...	18	400	190	170	<10	10	10	2900	10	<100
OCT										
26...	22	100	240	180	<10	10	10	1000	30	<100
NOV										
30...	17	800	250	180	0	0	9	310	30	5
DEC										
22...	15	100	200	170	1	0	19	460	40	7
JAN , 1978										
26...	45	200	170	160	0	0	19	940	40	5
FEB										
27...	6	100	130	70	0	10	18	2100	20	9
MAR										
22...	14	300	80	70	0	10	180	8600	10	32
APR										
27...	11	500	200	160	2	0	18	130	30	25
MAY										
11...	14	300	340	170	0	10	24	500	10	7
JUN , 1978										
14...	14	200	230	170	1	0	11	110	20	10
JUL										
11...	17	300	240	180	3	0	12	150	160	25
AUG										
09...	14	100	240	180	4	10	31	1700	<10	32
SEP										
12...	14	400	260	270	2	0	30	1500	10	12
344041111571000 - VERDE R. 1.3 MI. AB OAK CK NR CORNVILLE,AZ. (LAT 34 40 41 LONG 111 57 10)										
JUN , 1979										
12...	--	--	--	110	--	--	--	--	20	--
345954111441800 - OAK CREEK AT CAVE SPRINGS CAMPGROUND NR SEDONA (LAT 34 59 54 LONG 111 44 18)										
JUN , 1977										
20...	4	100	50	9	<10	10	<10	40	30	<100
345536111440100 - OAK CREEK AT ENCINOSO CAMP GROUNDS (LAT 34 55 36 LONG 111 44 01)										
JAN , 1975										
20...	--	--	--	10	--	--	--	--	20	--
345436111434000 - OAK CREEK BELOW INDIAN GARDENS (LAT 34 53 36 LONG 111 43 40)										
JAN , 1975										
20...	--	--	--	--	--	--	--	--	--	
JUN , 1977										
20...	0	4	.2	0	<10	10	.8	.00	4	

DATE	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	SELENIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOVERABLE (UG/L AS AG)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS (UG/L)
09504200 - VERDE R NR CORNVILLE, ARIZ. (LAT 34 40 58 LONG 111 57 28)									
NOV , 1976									
04...	40	10	.0	1	<10	40	1.4	.00	3
DEC									
10...	40	20	.0	1	<10	50	.8	.00	0
JAN , 1977									
14...	40	20	.2	1	<10	30	.7	.00	0
FEB									
24...	20	20	.0	1	<10	20	1.3	.00	1
MAR									
23...	40	10	.1	1	<10	30	2.2	.00	2
APR									
27...	60	30	.1	1	<10	20	1.6	.00	2
MAY									
25...	40	20	.1	1	<10	30	2.0	.00	2
JUN									
21...	70	20	.0	2	<10	60	2.2	.00	2
JUL									
22...	130	0	.0	1	<10	110	2.9	.00	8
AUG									
18...	220	8	.2	0	<10	110	6.3	.00	3
SEP									
29...	110	0	.0	0	<10	60	2.8	.00	4
OCT									
26...	60	20	.4	1	<10	50	1.3	.00	0
NOV									
30...	30	8	.0	1	0	10	1.2	.00	4
DEC									
22...	30	20	.0	1	1	20	1.2	.00	2
JAN , 1978									
26...	40	20	.0	1	1	40	1.7	.00	4
FEB									
27...	50	10	.0	0	0	50	4.9	.00	4
MAR									
22...	240	10	.0	3	1	280	7.8	.00	0
APR									
27...	40	30	.0	1	0	60	1.7	.00	0
MAY									
11...	70	30	.0	1	0	90	2.4	.00	0
JUN , 1978									
14...	30	10	.0	1	0	30	2.0	.00	1
JUL									
11...	40	40	.0	1	0	40	3.1	.00	1
AUG									
09...	100	10	.0	1	4	60	2.4	.00	2
SEP									
12...	80	10	4.5	0	0	60	3.7	.00	0
344041111571000 - VERDE R. 1.3 MI. AB OAK CK NR CORNVILLE,AZ. (LAT 34 40 41 LONG 111 57 10)									
JUN , 1979									
12...	--	--	--	--	--	--	--	--	--
345954111441800 - OAK CREEK AT CAVE SPRINGS CAMPGROUND NR SEDONA (LAT 34 59 54 LONG 111 44 18)									
JUN , 1977									
20...	0	0	.1	0	<10	20	.4	.00	4
345536111440100 - OAK CREEK AT ENCINOSO CAMP GROUNDS (LAT 34 55 36 LONG 111 44 01)									
JAN , 1975									
20...	--	--	--	--	--	--	--	--	--

345436111434000 - OAK CREEK BELOW INDIAN GARDENS (LAT 34 53 36 LONG 111 43 40)

JAN , 1975										
20...	--	--	--	10	--	--	--	--	10	--
JUN , 1977										
20...	5	0	60	10	<10	10	<10	50	30	<100

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (JTU)	OXYGEN, DIS-SOLVED (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)
09504420 - OAK CREEK AT SEDONA, AZ. (LAT 34 53 13 LONG 111 43 49)										
OCT , 1978										
11...	1650	30	300	8.4	16.5	--	--	4	140	0
NOV										
15...	1200	E120	175	--	6.0	12	10.7	K432	80	9
DEC										
13...	1330	42	240	8.4	8.0	1	10.8	5	140	12
JAN , 1979										
17...	1100	E2500	86	--	4.5	--	11.7	130	41	1
FEB										
13...	1330	E160	155	8.3	6.5	--	10.4	K6	77	5
MAR										
14...	1530	E500	88	8.1	5.5	--	11.2	K8	47	7
APR										
18...	1630	E300	108	8.1	12.0	--	9.6	K2	53	11
MAY										
10...	1400	43	270	8.5	11.0	--	9.3	K4	180	8
JUN										
14...	1430	28	285	8.4	1.0	--	11.0	K6	150	0
JUL										
12...	1600	27	305	--	20.0	1	7.4	K8	140	0
AUG										
11...	1400	30	280	6.7	20.0	1	8.5	K11	140	0
SEP										
26...	1200	29	315	8.2	15.0	--	8.4	K6	160	5
345333111435000 - OAK CREEK ABOVE BLACK DITCH (LAT 34 53 33 LONG 111 43 50)										
JAN , 1975										
20...	1340	32	305	8.3	7.5	--	--	--	170	7
345036111463700 - OAK CREEK AT CHAVEZ CROSSING (LAT 34 50 36 LONG 111 46 37)										
JAN , 1975										
20...	1055	30	308	8.3	5.5	--	--	--	160	1
344932111474500 - OAK CREEK BELOW DUNCAN DITCH (LAT 34 49 32 LONG 111 47 45)										
JAN , 1975										
20...	1520	22	309	8.3	--	--	--	--	160	0
09504440 - OAK CREEK AT RED ROCK CROSSING NR SEDONA,ARIZ (LAT 34 49 28 LONG 111 48 20)										
OCT , 1978										
11...	1320	14	310	8.2	18.5	--	9.6	45	150	0
NOV										
15...	0930	117	155	7.3	5.0	15	10.4	K280	76	6
DEC										
13...	1000	41	265	8.5	5.0	1	11.4	20	140	4
JAN , 1979										
17...	0800	E2500	165	--	6.0	--	10.7	260	60	5
FEB										
13...	1745	158	165	8.3	7.0	--	10.7	K20	95	60
MAR										
14...	1330	E450	89	8.8	6.0	--	10.9	K7	46	5
APR										
18...	1430	303	103	8.2	13.0	--	9.8	K1	52	3
MAY										
10...	1130	37	285	8.3	12.0	--	10.1	K6	160	20
JUN										
13...	1530	20	300	8.5	25.0	--	7.6	80	170	0
JUL										
12...	1330	14	316	8.2	26.0	1	7.5	--	150	5
AUG										
11...	0900	18	310	6.2	23.0	1	7.8	26	160	0
SEP										
26...	1530	17	323	8.4	21.0	--	--	K14	160	0
344918111495100 - OAK CREEK AT CROSS CREEK RANCH (LAT 34 49 18 LONG 111 49 51)										
JAN , 1975										
20...	1235	27	311	8.4	6.5	--	--	--	160	0
344732111532200 - OAK CREEK AT HIDDEN VALLEY (LAT 34 47 32 LONG 111 53 22)										
JAN , 1975										
20...	1420	26	315	8.4	8.0	--	--	--	160	0

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
09504420 - OAK CREEK AT SEDONA, AZ. (LAT 34 53 13 LONG 111 43 49)										
OCT , 1978										
11...	31	16	4.9	.2	.9	180	2	4.1	3.1	.1
NOV										
15...	18	8.4	2.8	.1	.8	86	--	4.9	2.4	.1
DEC										
13...	30	15	4.5	.2	.8	150	1	4.0	3.0	.1
JAN , 1979										
17...	8.9	4.6	1.8	.1	.8	49	--	4.8	1.1	.0
FEB										
13...	17	8.4	9.1	.5	.6	88	0	4.2	1.9	.1
MAR										
14...	11	4.7	2.0	.1	.5	49	0	6.1	1.3	.0
APR										
18...	12	5.7	2.0	.1	.7	52	0	4.3	1.0	.1
MAY										
10...	46	16	4.6	.1	1.0	170	20	5.1	2.9	.1
JUN										
14...	35	15	5.0	.2	1.0	180	9	2.7	6.7	.1
JUL										
12...	30	15	4.4	.2	1.1	190	--	3.6	3.0	.1
AUG										
11...	31	16	4.8	.2	1.1	190	2	5.0	3.2	.1
SEP										
26...	34	17	5.4	.2	.8	--	--	5.5	2.7	.1
345333111435000 - OAK CREEK ABOVE BLACK DITCH (LAT 34 53 33 LONG 111 43 50)										
JAN , 1975										
20...	41	16	4.7	.2	1.1	197	--	1.8	2.8	.1
345036111463700 - OAK CREEK AT CHAVEZ CROSSING (LAT 34 50 36 LONG 111 46 37)										
JAN , 1975										
20...	35	18	4.4	.2	1.1	196	--	1.5	2.6	.1
344932111474500 - OAK CREEK BELOW DUNCAN DITCH (LAT 34 49 32 LONG 111 47 45)										
JAN , 1975										
20...	36	16	4.7	.2	1.4	201	--	2.8	3.5	.1
09504440 - OAK CREEK AT RED ROCK CROSSING NR SEDONA,ARIZ (LAT 34 49 28 LONG 111 48 20)										
OCT , 1978										
11...	33	17	5.0	.2	.9	200	0	4.5	3.6	.1
NOV										
15...	17	8.2	2.8	.1	.8	86	0	3.5	2.6	.1
DEC										
13...	31	16	4.4	.2	.9	170	0	4.9	3.4	.1
JAN , 1979										
17...	18	8.6	2.3	.1	1.1	92	--	8.6	3.8	.1
FEB										
13...	20	11	3.1	.1	.7	43	0	10	2.2	.1
MAR										
14...	11	4.6	1.9	.1	.5	51	0	2.5	1.1	.0
APR										
18...	12	5.3	2.0	.1	.6	60	0	3.1	1.1	.1
MAY										
10...	36	17	4.8	.2	1.1	170	0	7.2	3.3	.1
JUN										
13...	37	18	7.0	.2	1.5	210	0	4.5	8.1	.1
JUL										
12...	33	17	4.7	.2	1.4	180	0	3.6	3.5	.1
AUG										
11...	34	17	4.9	.2	1.5	200	0	5.4	3.7	.1
SEP										
26...	34	18	5.5	.2	1.2	--	--	8.3	3.1	.1
344918111495100 - OAK CREEK AT CROSS CREEK RANCH (LAT 34 49 18 LONG 111 49 51)										
JAN , 1975										
20...	36	16	4.6	.2	1.1	203	0	2.2	3.8	.1
344732111532200 - OAK CREEK AT HIDDEN VALLEY (LAT 34 47 32 LONG 111 53 22)										
JAN , 1975										
20...	38	17	4.5	.2	1.0	204	0	1.7	2.7	.1

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)
09504420 - OAK CREEK AT SEDONA, AZ. (LAT 34 53 13 LONG 111 43 49)										
OCT , 1978										
11...	15	--	166	.23	.03	.07	.35	.38	.010	.00
NOV										
15...	15	115	96	.16	.07	.11	.30	.37	.060	.03
DEC										
13...	16	132	149	.18	.02	.10	.06	.08	.020	.00
JAN , 1979										
17...	9.5	--	56	.08	.07	.14	.48	.55	.230	.01
FEB										
13...	14	--	99	.13	.03	.05	.18	.21	.060	.01
MAR										
14...	12	--	62	.08	.02	.08	.16	.18	.050	.01
APR										
18...	12	--	64	.09	.01	.00	.14	.15	.060	.05
MAY										
10...	13	--	193	.26	.02	.02	.03	.05	.020	.02
JUN										
14...	14	--	178	.24	.08	.10	.16	.24	.050	.04
JUL										
12...	15	159	166	.22	.04	.00	.14	.18	.020	.00
AUG										
11...	16	167	173	.23	.03	.03	.10	.13	.020	.01
SEP										
26...	16	--	172	.23	.04	.02	.28	.32	.010	.00
345333111435000 - OAK CREEK ABOVE BLACK DITCH (LAT 34 53 33 LONG 111 43 50)										
JAN , 1975										
20...	15	158	180	.21	--	.04	--	--	--	.01
345036111463700 - OAK CREEK AT CHAVEZ CROSSING (LAT 34 50 36 LONG 111 46 37)										
JAN , 1975										
20...	14	150	174	.20	--	.04	--	--	--	.01
344932111474500 - OAK CREEK BELOW DUNCAN DITCH (LAT 34 49 32 LONG 111 47 45)										
JAN , 1975										
20...	15	162	179	.22	--	.05	--	--	--	.00
09504440 - OAK CREEK AT RED ROCK CROSSING NR SEDONA,ARIZ (LAT 34 49 28 LONG 111 48 20)										
OCT , 1978										
11...	16	--	179	.24	.05	.05	1.7	1.8	.010	.01
NOV										
15...	13	112	91	.15	.06	.07	.36	.42	.060	.03
DEC										
13...	15	152	160	.21	.00	.07	.22	.22	.020	.01
JAN , 1979										
17...	9.0	--	98	.13	.13	.14	.46	.59	.240	.02
FEB										
13...	13	--	82	.11	.08	.12	.42	.50	.100	.02
MAR										
14...	12	--	59	.08	.05	.03	.15	.20	.040	.02
APR										
18...	12	--	66	.09	.01	.04	.19	.20	.060	.04
MAY										
10...	13	--	166	.23	.00	.01	.04	.04	.020	.02
JUN										
13...	14	--	194	.26	.03	.00	.21	.24	.060	.02
JUL										
12...	16	179	168	.24	.01	.00	.14	.15	.010	.00
AUG										
11...	16	171	181	.23	.02	.02	.02	.04	.010	.01
SEP										
26...	17	--	183	.25	.02	.01	.40	.42	.020	.03
344918111495100 - OAK CREEK AT CROSS CREEK RANCH (LAT 34 49 18 LONG 111 49 51)										
JAN , 1975										
20...	14	162	178	.22	--	.04	--	--	--	.00
344732111532200 - OAK CREEK AT HIDDEN VALLEY (LAT 34 47 32 LONG 111 53 22)										
JAN , 1975										
20...	14	164	180	.22	--	.04	--	--	--	.01

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA)	BORON, TOTAL RECOV-ERABLE (UG/L AS B)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
09504420 - OAK CREEK AT SEDONA, AZ. (LAT 34 53 13 LONG 111 43 49)										
OCT , 1978 11...	5	200	100	30	0	0	4	50	<10	1
NOV 15...	3	100	70	20	6	0	4	750	240	39
DEC 13...	4	200	60	20	7	10	3	70	30	77
JAN , 1979 17...	2	20	70	30	--	0	17	6400	110	--
FEB 13...	2	100	60	60	--	0	4	130	40	--
MAR 14...	1	0	70	20	5	10	7	420	150	110
APR 18...	5	100	80	60	0	0	5	350	40	13
MAY 10...	7	200	340	30	0	10	0	30	10	19
JUN 14...	5	200	20	10	1	10	1	50	0	9
JUL 12...	6	200	40	440	0	0	6	30	10	15
AUG 11...	5	200	50	20	0	0	8	40	10	5
SEP 26...	5	100	40	20	0	0	1	50	<10	4
345333111435000 - OAK CREEK ABOVE BLACK DITCH (LAT 34 53 33 LONG 111 43 50)										
JAN , 1975 20...	--	--	--	20	--	--	--	--	10	--
345036111463700 - OAK CREEK AT CHAVEZ CROSSING (LAT 34 50 36 LONG 111 46 37)										
JAN , 1975 20...	--	--	--	20	--	--	--	--	10	--
344932111474500 - OAK CREEK BELOW DUNCAN DITCH (LAT 34 49 32 LONG 111 47 45)										
JAN , 1975 20...	--	--	--	10	--	--	--	--	60	--
09504440 - OAK CREEK AT RED ROCK CROSSING NR SEDONA,ARIZ (LAT 34 49 28 LONG 111 48 20)										
OCT , 1978 11...	4	--	90	30	0	0	4	90	10	1
NOV 15...	3	0	70	20	5	0	5	730	90	60
DEC 13...	4	200	40	20	5	0	3	80	40	19
JAN , 1979 17...	3	10	80	30	--	0	14	4200	40	--
FEB 13...	4	100	70	20	2	0	10	3600	30	--
MAR 14...	1	0	70	20	9	10	7	400	130	--
APR 18...	4	100	60	60	0	0	6	320	40	61
MAY 10...	--	200	190	40	1	10	2	60	10	24
JUN 13...	4	200	40	20	1	10	1	150	20	23
JUL 12...	4	200	40	10	0	0	36	110	30	15
AUG 11...	4	200	80	20	0	0	5	250	10	15
SEP 26...	5	100	50	20	0	10	1	120	10	0
344918111495100 - OAK CREEK AT CROSS CREEK RANCH (LAT 34 49 18 LONG 111 49 51)										
JAN , 1975 20...	--	--	--	20	--	--	--	--	30	--
344732111532200 - OAK CREEK AT HIDDEN VALLEY (LAT 34 47 32 LONG 111 53 22)										
JAN , 1975 20...	--	--	--	10	--	--	--	--	10	--

DATE	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	SELENIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOVERABLE (UG/L AS AG)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS (UG/L)
09504420 - OAK CREEK AT SEDONA, AZ. (LAT 34 53 13 LONG 111 43 49)									
OCT , 1978									
11...	10	2	.0	0	0	10	1.9	.00	5
NOV									
15...	0	5	.0	0	0	30	6.1	.00	2
DEC									
13...	20	2	.0	0	0	10	1.5	.00	1
JAN , 1979									
17...	270	0	.1	0	1	30	13	.00	1
FEB									
13...	10	2	.0	0	1	10	2.2	.00	3
MAR									
14...	10	0	.0	0	0	10	3.4	.00	4
APR									
18...	10	2	.1	0	0	20	3.2	.00	2
MAY									
10...	0	10	.1	0	0	30	--	.00	4
JUN									
14...	0	0	.0	0	0	20	2.1	.00	0
JUL									
12...	0	<1	.1	0	0	10	.5	.00	2
AUG									
11...	0	1	.0	0	0	10	.6	.00	3
SEP									
26...	10	4	.1	0	0	10	--	.00	1
345333111435000 - OAK CREEK ABOVE BLACK DITCH (LAT 34 53 33 LONG 111 43 50)									
JAN , 1975									
20...	--	--	--	--	--	--	--	--	--
345036111463700 - OAK CREEK AT CHAVEZ CROSSING (LAT 34 50 36 LONG 111 46 37)									
JAN , 1975									
20...	--	--	--	--	--	--	--	--	--
344932111474500 - OAK CREEK BELOW DUNCAN DITCH (LAT 34 49 32 LONG 111 47 45)									
JAN , 1975									
20...	--	--	--	--	--	--	--	--	--
09504440 - OAK CREEK AT RED ROCK CROSSING NR SEDONA,ARIZ (LAT 34 49 28 LONG 111 48 20)									
OCT , 1978									
11...	10	9	.0	0	0	10	3.1	.00	4
NOV									
15...	20	10	.0	0	0	20	6.8	.00	0
DEC									
13...	20	9	.0	0	0	20	1.7	.00	2
JAN , 1979									
17...	260	20	.0	0	1	30	12	.00	4
FEB									
13...	100	0	.1	0	1	20	6.0	.00	3
MAR									
14...	20	0	.2	0	0	20	3.5	.00	4
APR									
18...	10	2	.1	0	1	30	3.0	.00	2
MAY									
10...	0	10	.2	1	0	30	.7	.00	5
JUN									
13...	20	10	.1	0	0	10	--	.00	0
JUL									
12...	20	8	.1	0	0	70	1.7	.00	3
AUG									
11...	20	10	.0	0	0	20	.8	.00	0
SEP									
26...	10	10	.1	0	0	10	--	.00	3
344918111495100 - OAK CREEK AT CROSS CREEK RANCH (LAT 34 49 18 LONG 111 49 51)									
JAN , 1975									
20...	--	--	--	--	--	--	--	--	--
344732111532200 - OAK CREEK AT HIDDEN VALLEY (LAT 34 47 32 LONG 111 53 22)									
JAN , 1975									
20...	--	--	--	--	--	--	--	--	--

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (JTU)	OXYGEN, DIS-SOLVED (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)
09504500 - OAK CREEK NEAR CORNVILLE, ARIZ. (LAT 34 45 56 LONG 111 53 24)										
SEP , 1967										
14...	1120	25	396	7.5	22.0	--	--	--	198	64
APR , 1968										
15...	1330	63	210	7.1	16.0	--	--	--	104	1
OCT , 1971										
12...	1630	25	380	8.1	22.0	--	--	--	190	0
APR , 1973										
10...	1900	764	112	7.5	10.0	--	--	--	56	4
MAR , 1976										
24...	1630	298	180	8.0	15.0	10	8.4	--	80	7
APR										
20...	1600	383	110	7.9	14.0	28	8.4	--	55	0
MAY										
24...	1800	27	360	8.2	22.5	1	7.9	--	180	3
JUN										
29...	1630	12	420	8.0	26.0	1	8.0	--	210	1
JUL										
30...	1130	23	382	8.2	24.0	20	--	--	190	0
AUG										
31...	1800	16	405	8.1	23.0	15	6.4	--	210	0
SEP										
29...	1400	37	355	8.3	22.0	25	--	--	180	0
NOV										
11...	1430	35	380	8.1	15.0	6	9.4	810	190	4
DEC										
13...	1330	36	360	8.4	9.0	3	11.0	B140	190	0
JAN , 1977										
14...	1600	37	350	8.2	9.0	3	10.0	B140	180	0
FEB										
24...	1600	42	340	8.1	--	25	--	61	180	0
MAR										
23...	1400	30	340	8.3	17.0	6	10.6	B8	190	0
APR										
27...	1700	26	355	8.5	22.5	6	8.2	110	190	0
MAY										
25...	1315	33	350	8.3	23.0	6	7.4	B420	190	6
JUN										
20...	1430	16	410	8.4	25.0	6	9.4	84	190	5
JUL , 1977										
22...	1430	27	360	7.7	27.0	60	6.5	670	180	0
AUG										
18...	1300	31	335	8.1	28.5	86	7.2	560	180	0
SEP										
29...	1500	32	365	8.1	24.5	25	--	58	180	0
OCT										
26...	1500	27	360	8.2	18.5	5	9.0	630	200	0
NOV										
30...	1400	35	375	8.3	12.0	3	9.6	64	200	2
DEC										
22...	1300	35	350	8.3	8.0	--	10.7	K4	240	0
JAN , 1978										
26...	1200	49	565	8.4	7.5	5	10.9	34	170	10
FEB										
27...	1500	269	120	7.7	7.0	15	10.6	40	61	3
MAR										
01...	1600	12200	100	7.7	6.0	--	--	--	61	0
22...	1100	2170	145	7.9	11.0	120	9.4	560	60	10
APR										
27...	1000	28	410	8.1	18.0	1	8.8	160	190	4
MAY										
11...	1000	25	365	8.0	19.5	--	9.6	1900	--	--
JUN										
14...	1030	20	400	8.3	29.0	--	--	300	220	18
JUL										
11...	0900	18	420	8.2	23.0	--	7.8	K1400	200	8
AUG										
09...	1245	18	410	8.0	23.5	20	7.7	670	190	0
SEP										
12...	0930	19	380	8.7	21.0	--	--	1200	210	9
344532111533300 - OAK CREEK BELOW PAGE SPRINGS HATCHERY (LAT 34 45 32 LONG 111 53 33)										
JAN , 1975										
20...	1330	59	372	8.2	14.0	--	--	--	190	0
344550111543501 - SPRING CR 1.8 MI ABOVE MOUTH (LAT 34 45 50 LONG 111 54 35.01)										
APR , 1974										
25...	--	5.2	546	7.9	19.0	--	--	--	260	31
344052111561200 - OAK CREEK AB CON WITH VERDE R. NR CORNVILLE,ARIZ (LAT 34 40 52 LONG 111 56 12)										
JUN , 1977										
21...	1000	33	430	8.0	21.0	10	7.7	812	230	5

09504500 - OAK CREEK NEAR CORNVILLE, ARIZ. (LAT 34 45 56 LONG 111 53 24)

DATE	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
SEP , 1967										
14...	47	20	--	--	--	224	0	4.0	10	.0
APR , 1968										
15...	24	11	--	--	--	126	0	5.0	3.5	.1
OCT , 1971										
12...	42	20	8.6	.3	1.0	242	0	4.8	8.9	.0
APR , 1973										
10...	14	5.2	2.2	.1	.8	64	0	3.6	1.3	.1
MAR , 1976										
24...	18	8.4	3.3	.2	1.0	88	0	3.7	2.7	.1
APR										
20...	13	5.4	2.5	.1	.9	70	0	3.5	1.2	.1
MAY										
24...	41	19	7.8	.3	1.3	217	0	2.4	9.0	.2
JUN										
29...	46	22	11	.3	1.4	249	0	3.7	14	.2
JUL										
30...	45	20	8.3	.3	1.4	239	0	2.4	11	.1
AUG										
31...	48	22	11	.3	1.6	291	0	5.0	14	.1
SEP										
29...	42	19	8.0	.3	1.6	223	0	5.0	8.2	.1
NOV										
11...	43	21	7.8	.2	1.2	231	0	2.5	8.3	.1
DEC										
13...	42	20	7.1	.2	1.0	212	9	3.8	7.4	.1
JAN , 1977										
14...	40	19	7.4	.2	1.0	222	0	6.7	8.8	.1
FEB										
24...	39	19	7.6	.3	1.2	215	0	5.8	11	.1
MAR										
23...	42	20	7.9	.3	1.2	230	0	4.5	8.6	.1
APR										
27...	42	20	7.8	.2	1.2	230	5	4.6	8.0	.1
MAY										
25...	40	21	7.5	.2	1.2	220	0	3.5	8.0	.1
JUN										
20...	43	21	10	.3	1.3	230	0	2.5	14	.1
JUL , 1977										
22...	42	19	8.1	.3	1.7	230	0	1.1	8.4	.1
AUG										
18...	40	19	7.2	.2	1.5	220	0	4.7	7.8	.1
SEP										
29...	39	20	6.9	.2	1.4	220	0	5.0	8.0	.1
OCT										
26...	42	22	7.8	.2	1.3	240	0	2.8	9.5	.1
NOV										
30...	45	21	7.9	.2	1.1	240	0	3.9	9.4	.1
DEC										
22...	53	25	26	.7	2.0	300	0	12	14	.2
JAN , 1978										
26...	38	18	6.3	.2	1.0	190	2	4.6	6.4	.1
FEB										
27...	14	6.4	2.5	.1	.7	71	0	5.2	1.8	.1
MAR										
01...	17	4.4	2.0	.1	1.3	78	0	4.3	3.4	.1
22...	15	5.4	1.8	.1	.9	60	0	5.4	2.4	.1
APR										
27...	44	20	7.2	.2	1.3	230	0	5.0	8.8	.1
MAY										
11...	--	--	--	--	--	230	0	4.5	9.6	.1
JUN										
14...	45	25	.4	.0	1.3	240	0	4.3	12	.1
JUL										
11...	44	23	10	.3	1.5	240	0	4.8	14	.1
AUG										
09...	43	21	12	.4	1.5	250	0	8.7	14	.1
SEP										
12...	48	21	9.0	.3	1.5	240	0	4.9	13	.1

344532111533300 - OAK CREEK BELOW PAGE SPRINGS HATCHERY (LAT 34 45 32 LONG 111 53 33)

DATE	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
JAN , 1975										
20...	45	18	8.4	.3	1.5	231	--	3.2	7.8	.1

344550111543501 - SPRING CR 1.8 MI ABOVE MOUTH (LAT 34 45 50 LONG 111 54 35.01)

DATE	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
APR , 1974										
25...	62	26	17	.5	1.2	282	0	5.9	31	.1

344052111561200 - OAK CREEK AB CON WITH VERDE R. NR CORNVILLE,ARIZ (LAT 34 40 52 LONG 111 56 12)

DATE	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
JUN , 1977										
21...	51	24	14	.4	1.9	270	0	5.7	14	.1

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)
09504500 - OAK CREEK NEAR CORNVILLE, ARIZ. (LAT 34 45 56 LONG 111 53 24)										
SEP , 1967										
14...	18	--	211	.29	--	--	--	--	--	--
APR , 1968										
15...	15	--	125	.17	--	--	--	--	--	--
OCT , 1971										
12...	15	--	220	.30	--	.06	--	--	--	.01
APR , 1973										
10...	12	83	71	.11	--	.02	--	--	--	.04
MAR , 1976										
24...	13	103	94	.14	.01	.01	.21	.22	.030	.02
APR										
20...	11	92	73	.13	.07	.07	.20	.27	.080	.01
MAY										
24...	13	198	201	.27	.03	--	.19	.22	.060	--
JUN										
29...	17	254	241	.35	.10	.73	.19	.29	.050	.01
JUL										
30...	15	223	234	.30	.34	2.8	.38	.72	.070	.03
AUG										
31...	15	244	261	.33	.33	.13	.43	.76	.040	.02
SEP										
29...	15	200	209	.27	.08	.02	.62	.70	.080	.01
NOV										
11...	15	213	213	.29	.08	.03	.39	.47	.030	.01
DEC										
13...	14	188	209	.26	.10	.06	.40	.50	.010	.00
JAN , 1977										
14...	14	209	207	.28	.08	.08	.03	.11	.010	.03
FEB										
24...	13	195	203	.27	.06	.03	.25	.31	.030	.00
MAR										
23...	13	210	211	.29	.04	.04	.01	.05	.020	.02
APR										
27...	13	196	215	.27	.06	.05	.14	.20	.040	.05
MAY										
25...	13	195	203	.27	.04	.07	.00	.04	.060	.02
JUN										
20...	15	223	221	.30	.05	.07	.18	.23	.030	.01
JUL , 1977										
22...	16	213	210	.29	.07	.10	.28	.35	.100	.02
AUG										
18...	16	194	205	.26	.18	.11	.28	.46	.130	.02
SEP										
29...	17	190	206	.26	.04	.05	.16	.20	.140	.00
OCT										
26...	16	215	220	.29	.05	.05	.23	.28	.030	.01
NOV										
30...	16	208	223	.28	.08	.03	.04	.12	.010	.01
DEC										
22...	20	288	301	.39	.24	.23	.22	.46	.020	.00
JAN , 1978										
26...	15	168	185	.23	.03	.01	.05	.08	.030	.01
FEB										
27...	12	76	78	.10	.01	.03	.04	.05	.060	.01
MAR										
01...	7.6	80	79	.11	--	--	--	--	--	--
22...	10	61	71	.08	.05	.04	.45	.50	.310	.03
APR										
27...	14	190	214	.26	.05	.05	.18	.23	.030	.01
MAY										
11...	13	202	--	.27	.04	.05	.67	.71	.010	.01
JUN										
14...	16	--	223	.30	.05	.10	.26	.31	.010	.01
JUL										
11...	16	--	232	.32	.11	.12	--	--	.000	.02
AUG										
09...	16	226	240	.31	.10	.13	.51	.61	.060	.01
SEP										
12...	16	--	233	.32	.07	.14	.52	.59	.070	.01
344532111533300 - OAK CREEK BELOW PAGE SPRINGS HATCHERY (LAT 34 45 32 LONG 111 53 33)										
JAN , 1975										
20...	15	195	213	.27	--	.04	--	--	--	.01
344550111543501 - SPRING CR 1.8 MI ABOVE MOUTH (LAT 34 45 50 LONG 111 54 35.01)										
APR , 1974										
25...	13	298	295	.41	--	.02	--	--	--	.00
344052111561200 - OAK CREEK AB CON WITH VERDE R. NR CORNVILLE,ARIZ (LAT 34 40 52 LONG 111 56 12)										
JUN , 1977										
21...	17	252	261	.34	.01	.02	.10	.11	.050	.01

DATE	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA)	BORON, TOTAL RECOV-ERABLE (UG/L AS B)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
09504500 - OAK CREEK NEAR CORNVILLE, ARIZ. (LAT 34 45 56 LONG 111 53 24)										
SEP , 1967										
14...	--	--	--	--	--	--	--	--	0	--
APR , 1968										
15...	--	--	--	--	--	--	--	--	40	--
OCT , 1971										
12...	--	--	--	30	--	--	--	--	10	--
APR , 1973										
10...	--	--	--	10	--	--	--	--	60	--
MAR , 1976										
24...	2	0	10	10	<10	0	<10	300	80	<100
APR										
20...	2	0	250	30	<10	0	10	2000	40	<100
MAY										
24...	8	0	40	30	<10	10	<10	70	60	<100
JUN										
29...	11	500	40	10	<10	20	8	--	30	<100
JUL										
30...	14	200	210	30	<10	0	20	2100	20	<100
AUG										
31...	10	200	70	30	<10	0	20	350	10	<100
SEP										
29...	7	100	30	30	<10	10	10	1200	10	<100
NOV										
11...	8	200	90	20	<10	0	<10	300	50	<100
DEC										
13...	8	200	60	20	<10	10	10	120	50	<100
JAN , 1977										
14...	8	100	40	20	<10	0	<10	160	40	<100
FEB										
24...	17	200	60	20	<10	0	<10	630	20	<100
MAR										
23...	7	200	50	20	<10	10	<10	250	40	<100
APR										
27...	8	100	60	20	10	0	10	170	50	<100
MAY										
25...	6	200	80	20	<10	10	<10	250	20	<100
JUN										
20...	9	200	90	20	<10	10	10	150	40	<100
JUL , 1977										
22...	9	300	130	20	<10	10	<10	1100	20	<100
AUG										
18...	8	400	100	40	10	10	10	1400	20	<100
SEP										
29...	8	300	60	20	<10	10	<10	880	30	<100
OCT										
26...	9	100	60	30	<10	5	<10	150	30	<100
NOV										
30...	9	300	60	40	0	0	2	120	60	3
DEC										
22...	17	200	190	170	0	0	15	150	30	4
JAN , 1978										
26...	7	100	30	20	0	0	8	270	0	2
FEB										
27...	2	0	80	20	0	10	5	680	30	4
MAR										
01...	--	--	--	50	--	--	--	--	110	--
22...	5	300	50	40	0	10	12	4500	60	4
APR										
27...	8	300	70	20	1	0	2	80	10	5
MAY										
11...	8	100	1100	30	0	0	5	120	--	5
JUN										
14...	9	200	90	60	4	0	5	70	0	26
JUL										
11...	13	300	70	40	1	10	8	210	90	18
AUG										
09...	10	100	90	30	9	0	8	490	<10	130
SEP										
12...	8	400	70	20	3	0	7	940	10	42
344532111533300 - OAK CREEK BELOW PAGE SPRINGS HATCHERY (LAT 34 45 32 LONG 111 53 33)										
JAN , 1975										
20...	--	--	--	30	--	--	--	--	10	--
344550111543501 - SPRING CR 1.8 MI ABOVE MOUTH (LAT 34 45 50 LONG 111 54 35.01)										
APR , 1974										
25...	--	--	--	40	--	--	--	--	--	--
344052111561200 - OAK CREEK AB CON WITH VERDE R. NR CORNVILLE,ARIZ (LAT 34 40 52 LONG 111 56 12)										
JUN , 1977										
21...	19	200	110	70	<10	10	<10	360	60	<100

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	SELENIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOVERABLE (UG/L AS AG)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS (UG/L)
09504500 - OAK CREEK NEAR CORNVILLE, ARIZ. (LAT 34 45 56 LONG 111 53 24)									
SEP , 1967									
14...	--	--	--	--	--	--	--	--	--
APR , 1968									
15...	--	--	--	--	--	--	--	--	--
OCT , 1971									
12...	--	--	--	--	--	--	--	--	--
APR , 1973									
10...	--	--	--	--	--	--	--	--	--
MAR , 1976									
24...	20	10	.0	0	<10	0	7.3	.00	1
APR									
20...	60	90	.0	0	<10	10	6.8	.00	2
MAY									
24...	<10	10	.2	--	<10	20	2.2	.00	2
JUN									
29...	20	20	.2	0	<10	50	4.8	.00	0
JUL									
30...	80	20	.0	0	30	10	14	.00	4
AUG									
31...	30	20	.0	0	<10	60	3.0	.00	2
SEP									
29...	70	20	--	0	<10	20	2.4	.00	2
NOV									
11...	30	20	.0	0	<10	10	.8	.00	10
DEC									
13...	20	10	.0	0	<10	10	.8	.00	2
JAN , 1977									
14...	20	20	.1	0	<10	10	1.0	.00	0
FEB									
24...	60	10	.1	1	<10	20	2.0	.00	1
MAR									
23...	20	10	.3	1	<10	20	1.3	.00	2
APR									
27...	30	20	.2	1	<10	10	1.5	.00	1
MAY									
25...	30	10	.0	0	<10	10	--	.00	0
JUN									
20...	20	20	.4	1	<10	6	1.4	.00	4
JUL , 1977									
22...	90	8	.1	0	<10	40	2.5	.00	3
AUG									
18...	120	8	.1	0	<10	10	3.1	.00	1
SEP									
29...	40	20	.0	0	<10	40	7.0	.00	6
OCT									
26...	20	10	.0	0	<10	40	1.1	.00	0
NOV									
30...	20	0	.0	0	0	0	2.1	.00	4
DEC									
22...	0	10	.0	0	1	20	.5	.00	7
JAN , 1978									
26...	20	20	.0	0	0	20	1.9	.00	6
FEB									
27...	20	10	.0	0	0	20	4.4	.00	2
MAR									
01...	--	--	--	--	--	--	--	--	--
22...	160	10	.0	3	0	20	14	.00	2
APR									
27...	10	0	.7	0	0	10	2.2	.00	2
MAY									
11...	20	--	.0	0	0	30	4.7	.00	0
JUN									
14...	20	5	.0	0	0	10	1.8	.00	5
JUL									
11...	20	20	.2	0	0	20	2.1	.00	1
AUG									
09...	70	20	.0	0	0	30	2.9	.00	2
SEP									
12...	70	10	.0	0	0	20	3.1	.00	1
344532111533300 - OAK CREEK BELOW PAGE SPRINGS HATCHERY (LAT 34 45 32 LONG 111 53 33)									
JAN , 1975									
20...	--	--	--	--	--	--	--	--	--
344550111543501 - SPRING CR 1.8 MI ABOVE MOUTH (LAT 34 45 50 LONG 111 54 35.01)									
APR , 1974									
25...	--	--	--	--	--	--	--	--	--
344052111561200 - OAK CREEK AB CON WITH VERDE R. NR CORNVILLE,ARIZ (LAT 34 40 52 LONG 111 56 12)									
JUN , 1977									
21...	40	20	.3	0	<10	20	1.8	.00	3

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (JTU)	OXYGEN, DIS-SOLVED (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)
343843111555500 - VERDE R. BEL OK DITCH TURN OUT NR CORNVILLE,AZ. (LAT 34 38 43 LONG 111 55 55)										
JUN , 1979										
12...	1100	95	545	8.0	25.0	--	--	--	270	44
343753111534600 - VERDE R. BEL HD OF EUREKA DITCH NR CAMP VERDE,AZ (LAT 34 37 53 LONG 111 53 46)										
JUN , 1979										
12...	1515	70	542	8.1	30.0	--	--	--	240	31
343513111524600 - VERDE RIVER AT I-17 BRIDGE NR CAMP VERDE,ARIZ (LAT 34 35 13 LONG 111 52 46)										
JUN , 1977										
21...	1000	13	620	8.2	20.0	30	10.0	618	280	18
343424111513300 - VERDE R. AB BEAVER CREEK NR CAMP VERDE,AZ. (LAT 34 34 24 LONG 111 51 33)										
JUN , 1977										
21...	1500	27	680	8.3	24.0	30	8.8	34	300	21
JUN , 1979										
12...	1200	34	650	7.8	25.5	--	--	--	300	38
09505200 - WET BEAVER CREEK NEAR RIMROCK, ARIZONA (LAT 34 40 29 LONG 111 40 17)										
SEP , 1967										
15...	1400	6.2	267	7.3	22.0	--	--	--	130	0
APR , 1968										
15...	1430	32	118	6.7	14.0	--	--	--	54	0
OCT , 1971										
14...	1530	7.0	249	8.1	17.5	--	--	--	120	0
APR , 1973										
03...	1335	110	99	7.7	6.0	--	--	--	47	1
JUN , 1977										
21...	0900	6.7	260	8.2	18.0	1	8.3	83	120	0
09505250 - RED TANK DRAW NEAR RIMROCK, ARIZ (LAT 34 41 43 LONG 111 42 49)										
APR , 1968										
15...	1445	.30	330	7.4	17.0	--	--	--	160	0
APR , 1973										
03...	1640	52	105	7.8	8.0	--	--	--	48	1
FEB , 1978										
28...	1715	903	70	7.1	7.5	--	--	--	40	2
343752111473500 - WET BEAVER AT RUSTY SPUR FORD NR RIMROCK,ARIZ (LAT 34 37 52 LONG 111 47 35)										
JUN , 1977										
21...	0900	3.5	570	8.1	18.0	3	7.9	26	290	0
09505300 - RATTLESNAKE CANYON NEAR RIMROCK, ARIZ. (LAT 34 46 01 LONG 111 40 23)										
APR , 1968										
15...	1700	6.9	79	--	14.0	--	--	--	30	6
APR , 1973										
16...	1230	77	58	7.6	6.0	--	--	--	26	2
FEB , 1978										
28...	1330	525	55	6.8	.5	--	--	--	36	11
09505350 - DRY BEAVER CREEK NEAR RIMROCK, ARIZ. (LAT 34 43 43 LONG 111 46 30)										
APR , 1968										
15...	1400	58	77	7.0	15.0	--	--	--	34	1
MAR , 1973										
02...	1430	139	71	7.8	7.5	--	--	--	31	0
APR										
26...	1500	548	50	7.7	--	--	--	--	21	0
FEB , 1976										
06...	1745	669	60	6.9	--	--	--	--	32	4
09...	1650	4140	40	6.9	4.5	--	--	--	21	3
MAR , 1978										
02...	1730	5700	50	7.5	7.0	--	--	--	30	0
343428111511600 - BEAVER CREEK AB CON WITH VERDE R. AT CAMP VERDE (LAT 34 34 28 LONG 111 51 16)										
JUN , 1977										
21...	1530	10	520	8.6	24.0	15	13.4	480	260	0

DATE	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
343843111555500 - VERDE R. BEL OK DITCH TURN OUT NR CORNVILLE,AZ. (LAT 34 38 43 LONG 111 55 55)										
JUN , 1979										
12...	55	31	22	.6	2.5	270	0	45	13	.2
343753111534600 - VERDE R. BEL HD OF EUREKA DITCH NR CAMP VERDE,AZ (LAT 34 37 53 LONG 111 53 46)										
JUN , 1979										
12...	45	32	24	.7	2.6	260	0	53	14	.2
343513111524600 - VERDE RIVER AT I-17 BRIDGE NR CAMP VERDE,ARIZ (LAT 34 35 13 LONG 111 52 46)										
JUN , 1977										
21...	53	36	28	.7	2.6	320	0	50	22	.2
343424111513300 - VERDE R. AB BEAVER CREEK NR CAMP VERDE,AZ. (LAT 34 34 24 LONG 111 51 33)										
JUN , 1977										
21...	54	40	43	1.1	3.2	340	0	76	27	.4
JUN , 1979										
12...	56	39	36	.9	2.9	320	0	77	17	.3
09505200 - WET BEAVER CREEK NEAR RIMROCK, ARIZONA (LAT 34 40 29 LONG 111 40 17)										
SEP , 1967										
15...	29	14	--	--	--	160	0	2.0	4.5	.0
APR , 1968										
15...	11	6.4	--	--	--	68	0	4.0	1.5	.1
OCT , 1971										
14...	24	14	6.3	.5	1.1	164	0	3.8	2.8	.1
APR , 1973										
03...	11	4.7	2.2	.1	1.3	56	0	7.8	2.1	.0
JUN , 1977										
21...	25	15	6.7	.3	1.5	160	0	2.5	3.1	.1
09505250 - RED TANK DRAW NEAR RIMROCK, ARIZ (LAT 34 41 43 LONG 111 42 49)										
APR , 1968										
15...	38	17	--	--	--	200	0	5.0	7.0	.1
APR , 1973										
03...	12	4.4	2.2	.1	1.5	57	0	7.0	2.4	.0
FEB , 1978										
28...	11	3.1	2.0	.1	1.7	47	0	3.5	2.9	.1
343752111473500 - WET BEAVER AT RUSTY SPUR FORD NR RIMROCK,ARIZ (LAT 34 37 52 LONG 111 47 35)										
JUN , 1977										
21...	60	35	36	.9	3.3	380	0	8.2	26	.1
09505300 - RATTLESNAKE CANYON NEAR RIMROCK, ARIZ. (LAT 34 46 01 LONG 111 40 23)										
APR , 1968										
15...	6.0	3.6	--	--	--	30	0	11	2.5	.1
APR , 1973										
16...	5.8	2.8	1.8	.2	.5	29	0	3.6	.7	.0
FEB , 1978										
28...	9.0	3.2	4.1	.3	1.1	30	0	3.4	.9	.1
09505350 - DRY BEAVER CREEK NEAR RIMROCK, ARIZ. (LAT 34 43 43 LONG 111 46 30)										
APR , 1968										
15...	7.6	3.6	--	--	--	40	0	4.0	1.0	.1
MAR , 1973										
02...	7.1	3.1	1.9	.2	.7	39	0	6.1	1.8	.1
APR										
26...	4.8	2.2	1.3	.1	.5	26	0	3.7	1.5	.0
FEB , 1976										
06...	8.4	2.7	1.4	.1	1.2	34	0	5.5	1.9	.2
09...	5.3	1.8	1.1	.1	1.1	22	0	3.5	1.0	.1
MAR , 1978										
02...	8.2	2.2	1.1	.1	1.1	37	0	4.1	1.3	.1
343428111511600 - BEAVER CREEK AB CON WITH VERDE R. AT CAMP VERDE (LAT 34 34 28 LONG 111 51 16)										
JUN , 1977										
21...	50	33	25	.7	2.8	320	0	27	20	.2

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)
343843111555500 - VERDE R. BEL OK DITCH TURN OUT NR CORNVILLE,AZ. (LAT 34 38 43 LONG 111 55 55)										
JUN , 1979										
12...	18	295	320	.40	--	.00	--	--	--	--
343753111534600 - VERDE R. BEL HD OF EUREKA DITCH NR CAMP VERDE,AZ (LAT 34 37 53 LONG 111 53 46)										
JUN , 1979										
12...	16	298	315	.41	--	.01	--	--	--	--
343513111524600 - VERDE RIVER AT I-17 BRIDGE NR CAMP VERDE,ARIZ (LAT 34 35 13 LONG 111 52 46)										
JUN , 1977										
21...	24	347	374	.47	.08	.07	.15	.23	.060	.01
343424111513300 - VERDE R. AB BEAVER CREEK NR CAMP VERDE,AZ. (LAT 34 34 24 LONG 111 51 33)										
JUN , 1977										
21...	38	431	451	.59	.19	.23	.13	.32	.100	.02
JUN , 1979										
12...	26	403	413	.55	--	.16	--	--	--	--
09505200 - WET BEAVER CREEK NEAR RIMROCK, ARIZONA (LAT 34 40 29 LONG 111 40 17)										
SEP , 1967										
15...	21	--	156	.21	--	--	--	--	--	--
APR , 1968										
15...	17	--	--	--	--	--	--	--	--	--
OCT , 1971										
14...	20	--	153	.21	--	.05	--	--	--	.02
APR , 1973										
03...	14	72	71	.10	--	.00	--	--	--	.05
JUN , 1977										
21...	22	136	158	.19	.17	.60	.05	.22	.030	.01
09505250 - RED TANK DRAW NEAR RIMROCK, ARIZ (LAT 34 41 43 LONG 111 42 49)										
APR , 1968										
15...	25	--	--	--	--	--	--	--	--	--
APR , 1973										
03...	14	66	72	.09	--	.03	--	--	--	.05
FEB , 1978										
28...	12	89	60	.12	--	--	--	--	--	--
343752111473500 - WET BEAVER AT RUSTY SPUR FORD NR RIMROCK,ARIZ (LAT 34 37 52 LONG 111 47 35)										
JUN , 1977										
21...	24	330	381	.45	.05	.01	.00	.05	.020	.01
09505300 - RATTLESNAKE CANYON NEAR RIMROCK, ARIZ. (LAT 34 46 01 LONG 111 40 23)										
APR , 1968										
15...	17	--	60	.08	--	--	--	--	--	--
APR , 1973										
16...	13	60	43	.08	--	.00	--	--	--	.03
FEB , 1978										
28...	.3	54	37	.07	--	--	--	--	--	--
09505350 - DRY BEAVER CREEK NEAR RIMROCK, ARIZ. (LAT 34 43 43 LONG 111 46 30)										
APR , 1968										
15...	16	--	54	.07	--	--	--	--	--	--
MAR , 1973										
02...	13	78	53	.11	--	.01	--	--	--	.02
APR										
26...	11	57	38	.08	--	.01	--	--	--	.03
FEB , 1976										
06...	9.4	--	49	.07	--	.21	--	--	--	.01
09...	6.8	26	32	.04	--	.06	--	--	--	.01
MAR , 1978										
02...	5.7	53	42	.07	--	--	--	--	--	--
343428111511600 - BEAVER CREEK AB CON WITH VERDE R. AT CAMP VERDE (LAT 34 34 28 LONG 111 51 16)										
JUN , 1977										
21...	34	333	352	.45	.12	.32	.13	.25	.070	.02

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA)	BORON, TOTAL RECOV-ERABLE (UG/L AS B)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
343843111555500 - VERDE R. BEL OK DITCH TURN OUT NR CORNVILLE,AZ. (LAT 34 38 43 LONG 111 55 55)										
JUN , 1979										
12...	--	--	--	140	--	--	--	--	10	--
343753111534600 - VERDE R. BEL HD OF EUREKA DITCH NR CAMP VERDE,AZ (LAT 34 37 53 LONG 111 53 46)										
JUN , 1979										
12...	--	--	--	160	--	--	--	--	0	--
343513111524600 - VERDE RIVER AT I-17 BRIDGE NR CAMP VERDE,ARIZ (LAT 34 35 13 LONG 111 52 46)										
JUN , 1977										
21...	17	100	240	170	<10	10	20	630	40	<100
343424111513300 - VERDE R. AB BEAVER CREEK NR CAMP VERDE,AZ. (LAT 34 34 24 LONG 111 51 33)										
JUN , 1977										
21...	23	1200	200	200	<10	10	<10	860	40	<100
JUN , 1979										
12...	--	--	--	190	--	--	--	--	0	--
09505200 - WET BEAVER CREEK NEAR RIMROCK, ARIZONA (LAT 34 40 29 LONG 111 40 17)										
SEP , 1967										
15...	--	--	--	--	--	--	--	--	0	--
APR , 1968										
15...	--	--	--	--	--	--	--	--	130	--
OCT , 1971										
14...	--	--	--	10	--	--	--	--	20	--
APR , 1973										
03...	--	--	--	40	--	--	--	--	30	--
JUN , 1977										
21...	13	100	60	9	<10	10	<10	70	40	<100
09505250 - RED TANK DRAW NEAR RIMROCK, ARIZ (LAT 34 41 43 LONG 111 42 49)										
APR , 1968										
15...	--	--	--	--	--	--	--	--	0	--
APR , 1973										
03...	--	--	--	40	--	--	--	--	70	--
FEB , 1978										
28...	--	--	--	60	--	--	--	--	110	--
343752111473500 - WET BEAVER AT RUSTY SPUR FORD NR RIMROCK,ARIZ (LAT 34 37 52 LONG 111 47 35)										
JUN , 1977										
21...	27	0	400	380	<10	10	<10	110	100	<100
09505300 - RATTLESNAKE CANYON NEAR RIMROCK, ARIZ. (LAT 34 46 01 LONG 111 40 23)										
APR , 1968										
15...	--	--	--	--	--	--	--	--	80	--
APR , 1973										
16...	--	--	--	0	--	--	--	--	70	--
FEB , 1978										
28...	--	--	--	30	--	--	--	--	150	--
09505350 - DRY BEAVER CREEK NEAR RIMROCK, ARIZ. (LAT 34 43 43 LONG 111 46 30)										
APR , 1968										
15...	--	--	--	--	--	--	--	--	60	--
MAR , 1973										
02...	--	--	--	20	--	--	--	--	50	--
APR										
26...	--	--	--	20	--	--	--	--	100	--
FEB , 1976										
06...	--	--	--	70	--	--	--	--	40	--
09...	--	--	--	50	--	--	--	--	20	--
MAR , 1978										
02...	--	--	--	40	--	--	--	--	90	--
343428111511600 - BEAVER CREEK AB CON WITH VERDE R. AT CAMP VERDE (LAT 34 34 28 LONG 111 51 16)										
JUN , 1977										
21...	24	700	210	180	<10	10	340	460	130	<100

DATE	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	SELENIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOVERABLE (UG/L AS AG)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS (UG/L)
343843111555500 - VERDE R. BEL OK DITCH TURN OUT NR CORNVILLE,AZ. (LAT 34 38 43 LONG 111 55 55)									
JUN , 1979 12...	--	--	--	--	--	--	--	--	--
343753111534600 - VERDE R. BEL HD OF EUREKA DITCH NR CAMP VERDE,AZ (LAT 34 37 53 LONG 111 53 46)									
JUN , 1979 12...	--	--	--	--	--	--	--	--	--
343513111524600 - VERDE RIVER AT I-17 BRIDGE NR CAMP VERDE,ARIZ (LAT 34 35 13 LONG 111 52 46)									
JUN , 1977 21...	50	20	.0	2	<10	20	1.3	.00	2
343424111513300 - VERDE R. AB BEAVER CREEK NR CAMP VERDE,AZ. (LAT 34 34 24 LONG 111 51 33)									
JUN , 1977 21...	60	20	.3	4	<10	20	2.4	.00	4
JUN , 1979 12...	--	--	--	--	--	--	--	--	--
09505200 - WET BEAVER CREEK NEAR RIMROCK, ARIZONA (LAT 34 40 29 LONG 111 40 17)									
SEP , 1967 15...	--	--	--	--	--	--	--	--	--
APR , 1968 15...	--	--	--	--	--	--	--	--	--
OCT , 1971 14...	--	--	--	--	--	--	--	--	--
APR , 1973 03...	--	--	--	--	--	--	--	--	--
JUN , 1977 21...	10	8	.3	0	<10	20	11	.00	2
09505250 - RED TANK DRAW NEAR RIMROCK, ARIZ (LAT 34 41 43 LONG 111 42 49)									
APR , 1968 15...	--	--	--	--	--	--	--	--	--
APR , 1973 03...	--	--	--	--	--	--	--	--	--
FEB , 1978 28...	--	--	--	--	--	--	--	--	--
343752111473500 - WET BEAVER AT RUSTY SPUR FORD NR RIMROCK,ARIZ (LAT 34 37 52 LONG 111 47 35)									
JUN , 1977 21...	20	20	.0	2	<10	20	.9	.00	2
09505300 - RATTLESNAKE CANYON NEAR RIMROCK, ARIZ. (LAT 34 46 01 LONG 111 40 23)									
APR , 1968 15...	--	--	--	--	--	--	--	--	--
APR , 1973 16...	--	--	--	--	--	--	--	--	--
FEB , 1978 28...	--	--	--	--	--	--	--	--	--
09505350 - DRY BEAVER CREEK NEAR RIMROCK, ARIZ. (LAT 34 43 43 LONG 111 46 30)									
APR , 1968 15...	--	--	--	--	--	--	--	--	--
MAR , 1973 02...	--	--	--	--	--	--	--	--	--
APR 26...	--	--	--	--	--	--	--	--	--
FEB , 1976 06...	--	--	--	--	--	--	--	--	--
09...	--	--	--	--	--	--	--	--	--
MAR , 1978 02...	--	--	--	--	--	--	--	--	--
343428111511600 - BEAVER CREEK AB CON WITH VERDE R. AT CAMP VERDE (LAT 34 34 28 LONG 111 51 16)									
JUN , 1977 21...	30	0	.0	3	<10	20	1.9	.00	3

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	TIME	STREAMFLOW, INSTANTANEOUS (CFS)	SPECIFIC CONDUCTANCE (MICROMHOS)	PH (UNITS)	TEMPERATURE (DEG C)	TURBIDITY (JTU)	OXYGEN, DISSOLVED (MG/L)	COLIFORM, FECAL, 0.7 UM-MF (COLS./100 ML)	HARDNESS (MG/L AS CACO3)	HARDNESS, NONCARBONATE (MG/L CACO3)
09505550 - VERDE RIVER BELOW CAMP VERDE,ARIZ (LAT 34 33 02 LONG 111 51 02)										
JUN , 1977										
21...	1130	27	630	8.1	22.0	30	10.2	56	290	15
FEB , 1978										
28...	1630	8310	128	7.9	7.0	--	--	--	71	0
343259111510500 - VERDE R. .25 MI BEL STA. 095055.50 (LAT 34 32 59 LONG 111 51 05)										
JUN , 1979										
12...	1600	36	640	8.1	27.5	--	--	--	300	58
343124111500400 - VERDE R. AB DAMND S FINAL WASTE NR CAMP VERDE,AZ (LAT 34 31 24 LONG 111 50 04)										
JUN , 1979										
13...	1700	60	850	8.1	29.0	--	--	--	340	88
343015111494300 - VERDE R. ABV WEST CLEAR CREEK NR CAMP VERDE,AZ. (LAT 34 30 15 LONG 111 49 43)										
JUN , 1977										
21...	1630	51	780	8.4	26.0	20	10.4	88	350	64
JUN , 1979										
12...	1000	103	880	7.8	24.0	--	--	--	380	110
09505800 - WEST CLEAR CREEK NEAR CAMP VERDE, ARIZ. (LAT 34 32 19 LONG 111 41 36)										
SEP , 1967										
15...	1630	14	366	7.5	22.0	--	--	--	190	0
APR , 1968										
15...	1600	135	161	7.0	15.0	--	--	--	76	0
OCT , 1971										
12...	1330	15	370	8.3	--	--	--	--	190	0
OCT , 1972										
07...	1815	1020	127	6.8	17.0	--	--	--	58	6
APR , 1973										
11...	1215	1300	81	7.3	5.5	--	--	--	39	2
APR , 1976										
21...	1720	546	70	7.6	11.0	--	--	--	43	5
JUN , 1977										
21...	1030	14	375	8.6	19.5	2	--	82	190	0
MAR , 1978										
02...	1400	2670	65	7.4	6.5	--	--	--	37	3
342848111475700 - VERDE R. AT BEASLEY FLATS NR CAMP VERDE,AZ. (LAT 34 28 48 LONG 111 47 57)										
JUN , 1979										
13...	1100	85	840	8.0	24.0	--	--	--	360	110
342749111471100 - VERDE R. ABV. THE FALLS NR CAMP VERDE,AZ. (LAT 34 27 49 LONG 111 47 11)										
JUN , 1979										
13...	1100	90	860	7.7	23.0	--	--	--	370	110

DATE	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
09505550 - VERDE RIVER BELOW CAMP VERDE,ARIZ (LAT 34 33 02 LONG 111 51 02)										
JUN , 1977										
21...	55	38	40	1.0	3.3	340	0	63	26	.3
FEB , 1978										
28...	19	5.8	4.1	.2	1.5	98	0	5.6	5.3	.1
343259111510500 - VERDE R. .25 MI BEL STA. 095055.50 (LAT 34 32 59 LONG 111 51 05)										
JUN , 1979										
12...	56	40	37	.9	3.4	300	0	77	21	.3
343124111500400 - VERDE R. AB DAMND S FINAL WASTE NR CAMP VERDE,AZ (LAT 34 31 24 LONG 111 50 04)										
JUN , 1979										
13...	58	48	59	1.4	4.6	310	0	150	35	.3
343015111494300 - VERDE R. ABV WEST CLEAR CREEK NR CAMP VERDE,AZ. (LAT 34 30 15 LONG 111 49 43)										
JUN , 1977										
21...	60	49	60	1.4	4.3	350	0	140	37	.4
JUN , 1979										
12...	70	49	61	1.4	4.5	320	0	170	37	.4
09505800 - WEST CLEAR CREEK NEAR CAMP VERDE, ARIZ. (LAT 34 32 19 LONG 111 41 36)										
SEP , 1967										
15...	42	20	--	--	--	240	0	5.0	4.5	.0
APR , 1968										
15...	17	8.1	--	--	--	96	0	3.0	1.5	.1
OCT , 1971										
12...	39	23	5.7	.2	1.1	251	0	1.5	3.3	.1
OCT , 1972										
07...	14	5.6	1.5	.1	1.9	63	0	9.3	1.9	.1
APR , 1973										
11...	9.3	3.8	1.5	.1	.8	45	0	4.0	.9	.1
APR , 1976										
21...	9.6	4.5	4.3	.3	1.2	46	0	9.7	3.2	.1
JUN , 1977										
21...	38	23	6.4	.2	1.5	230	1	3.8	3.9	.1
MAR , 1978										
02...	9.2	3.4	1.1	.1	1.3	41	0	3.8	2.5	.1
342848111475700 - VERDE R. AT BEASLEY FLATS NR CAMP VERDE,AZ. (LAT 34 28 48 LONG 111 47 57)										
JUN , 1979										
13...	63	50	61	1.4	4.3	310	0	170	40	.4
342749111471100 - VERDE R. ABV. THE FALLS NR CAMP VERDE,AZ. (LAT 34 27 49 LONG 111 47 11)										
JUN , 1979										
13...	67	49	57	1.3	4.1	320	0	160	37	.3

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN,AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)
09505550 - VERDE RIVER BELOW CAMP VERDE,ARIZ (LAT 34 33 02 LONG 111 51 02)										
JUN , 1977										
21...	35	409	429	.56	.16	.19	.47	.63	.110	.02
FEB , 1978										
28...	10	115	100	.16	--	--	--	--	--	--
343259111510500 - VERDE R. .25 MI BEL STA. 095055.50 (LAT 34 32 59 LONG 111 51 05)										
JUN , 1979										
12...	29	384	412	.52	--	.03	--	--	--	--
343124111500400 - VERDE R. AB DAMND S FINAL WASTE NR CAMP VERDE,AZ (LAT 34 31 24 LONG 111 50 04)										
JUN , 1979										
13...	28	521	536	.71	--	.01	--	--	--	--
343015111494300 - VERDE R. ABV WEST CLEAR CREEK NR CAMP VERDE,AZ. (LAT 34 30 15 LONG 111 49 43)										
JUN , 1977										
21...	34	570	588	.78	.08	6.9	.11	.19	.170	.01
JUN , 1979										
12...	28	550	578	.75	--	.01	--	--	--	--
09505800 - WEST CLEAR CREEK NEAR CAMP VERDE, ARIZ. (LAT 34 32 19 LONG 111 41 36)										
SEP , 1967										
15...	18	--	214	.29	--	--	--	--	--	--
APR , 1968										
15...	18	--	--	--	--	--	--	--	--	--
OCT , 1971										
12...	17	--	214	.29	--	.01	--	--	--	.01
OCT , 1972										
07...	14	110	80	.15	--	.00	--	--	--	.07
APR , 1973										
11...	10	68	53	.09	--	.02	--	--	--	.05
APR , 1976										
21...	11	85	67	.12	--	.07	--	--	--	.01
JUN , 1977										
21...	16	192	208	.26	.04	.08	.09	.13	.030	.01
MAR , 1978										
02...	9.1	68	51	.09	--	--	--	--	--	--
342848111475700 - VERDE R. AT BEASLEY FLATS NR CAMP VERDE,AZ. (LAT 34 28 48 LONG 111 47 57)										
JUN , 1979										
13...	26	571	577	.78	--	2.0	--	--	--	--
342749111471100 - VERDE R. ABV. THE FALLS NR CAMP VERDE,AZ. (LAT 34 27 49 LONG 111 47 11)										
JUN , 1979										
13...	25	544	557	.74	--	.00	--	--	--	--

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV- ERABLE (UG/L AS BA)	BORON, TOTAL RECOV- ERABLE (UG/L AS B)	BORON, DIS- SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	CHRO- MIUM, TOTAL RECOV- ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)
09505550 - VERDE RIVER BELOW CAMP VERDE,ARIZ (LAT 34 33 02 LONG 111 51 02)										
JUN , 1977 21...	22	100	240	200	<10	10	10	1100	40	<100
FEB , 1978 28...	--	--	--	70	--	--	--	--	110	--
343259111510500 - VERDE R. .25 MI BEL STA. 09505550 (LAT 34 32 59 LONG 111 51 05)										
JUN , 1979 12...	--	--	--	180	--	--	--	--	10	--
343124111500400 - VERDE R. AB OAMND S FINAL WASTE NR CAMP VERDE,AZ (LAT 34 31 24 LONG 111 50 04)										
JUN , 1979 13...	--	--	--	250	--	--	--	--	10	--
343015111494300 - VERDE R. ABV WEST CLEAR CREEK NR CAMP VERDE,AZ. (LAT 34 30 15 LONG 111 49 43)										
JUN , 1977 21...	28	100	280	280	<10	10	20	520	20	<100
JUN , 1979 12...	--	--	--	260	--	--	--	--	10	--
09505800 - WEST CLEAR CREEK NEAR CAMP VERDE, ARIZ. (LAT 34 32 19 LONG 111 41 36)										
SEP , 1967 15...	--	--	--	--	--	--	--	--	--	--
APR , 1968 15...	--	--	--	--	--	--	--	--	60	--
OCT , 1971 12...	--	--	--	20	--	--	--	--	0	--
OCT , 1972 07...	--	--	--	80	--	--	--	--	100	--
APR , 1973 11...	--	--	--	20	--	--	--	--	90	--
APR , 1976 21...	--	--	--	70	--	--	--	--	30	--
JUN , 1977 21...	2	800	70	10	<10	10	<10	40	40	<100
MAR , 1978 02...	--	--	--	50	--	--	--	--	140	--
342848111475700 - VERDE R. AT BEASLEY FLATS NR CAMP VERDE,AZ. (LAT 34 28 48 LONG 111 47 57)										
JUN , 1979 13...	--	--	--	290	--	--	--	--	10	--
342749111471100 - VERDE R. ABV. THE FALLS NR CAMP VERDE,AZ. (LAT 34 27 49 LONG 111 47 11)										
JUN , 1979 13...	--	--	--	280	--	--	--	--	10	--

DATE	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	SELENIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOVERABLE (UG/L AS AG)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS (UG/L)
09505550 - VERDE RIVER BELOW CAMP VERDE,ARIZ (LAT 34 33 02 LONG 111 51 02)									
JUN , 1977 21...	60	20	.0	3	<10	40	2.5	.00	3
FEB , 1978 28...	--	--	--	--	--	--	--	--	--
343259111510500 - VERDE R. .25 MI BEL STA. 095055.50 (LAT 34 32 59 LONG 111 51 05)									
JUN , 1979 12...	--	--	--	--	--	--	--	--	--
343124111500400 - VERDE R. AB DAMND S FINAL WASTE NR CAMP VERDE,AZ (LAT 34 31 24 LONG 111 50 04)									
JUN , 1979 13...	--	--	--	--	--	--	--	--	--
343015111494300 - VERDE R. ABV WEST CLEAR CREEK NR CAMP VERDE,AZ. (LAT 34 30 15 LONG 111 49 43)									
JUN , 1977 21...	40	4	.0	4	<10	50	2.1	.00	3
JUN , 1979 12...	--	--	--	--	--	--	--	--	--
09505800 - WEST CLEAR CREEK NEAR CAMP VERDE, ARIZ. (LAT 34 32 19 LONG 111 41 36)									
SEP , 1967 15...	--	--	--	--	--	--	--	--	--
APR , 1968 15...	--	--	--	--	--	--	--	--	--
OCT , 1971 12...	--	--	--	--	--	--	--	--	--
OCT , 1972 07...	--	--	--	--	--	--	--	--	--
APR , 1973 11...	--	--	--	--	--	--	--	--	--
APR , 1976 21...	--	--	--	--	--	--	--	--	--
JUN , 1977 21...	8	10	.3	1	<10	30	1.2	.00	3
MAR , 1978 02...	--	--	--	--	--	--	--	--	--
342848111475700 - VERDE R. AT BEASLEY FLATS NR CAMP VERDE,AZ. (LAT 34 28 48 LONG 111 47 57)									
JUN , 1979 13...	--	--	--	--	--	--	--	--	--
342749111471100 - VERDE R. ABV. THE FALLS NR CAMP VERDE,AZ. (LAT 34 27 49 LONG 111 47 11)									
JUN , 1979 13...	--	--	--	--	--	--	--	--	--

DATE	TIME	STREAM-FLOW, INSTAN-TANEOUS (CFS)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	TUR-BID-ITY (JTU)	OXYGEN, DIS-SOLVED (MG/L)	COLI-FORM, FECAL, 0.7 UM-MF (COLS./100 ML)	HARD-NESS (MG/L AS CACO3)	HARD-NESS, NONCAR-BONATE (MG/L CACO3)
09506000 - VERDE RIVER NEAR CAMP VERDE, ARIZ. (LAT 34 27 00 LONG 111 47 00)										
JUL , 1976										
08...	1500	46	1000	8.0	28.5	--	--	--	370	110
SEP										
01...	1400	40	810	8.1	28.0	--	--	--	330	74
OCT										
06...	1240	161	690	8.1	18.5	--	--	--	290	57
NOV										
08...	1200	151	670	8.0	13.5	--	--	--	300	32
APR , 1977										
01...	1450	150	650	8.2	13.5	--	--	--	280	22
JUN										
22...	1200	53	870	6.3	22.0	15	8.2	82	350	83
OCT										
04...	1630	152	690	8.3	23.0	--	--	--	290	43
OCT , 1978										
10...	1410	99	900	8.1	21.0	--	--	32	340	64
NOV										
14...	1700	280	269	7.8	9.0	130	10.1	K1060	120	14
DEC										
12...	1630	218	595	8.6	7.0	10	12.1	15	270	27
JAN , 1979										
17...	1600	755	115	--	8.0	--	12.9	460	66	15
FEB										
14...	0945	E1500	225	8.4	7.0	--	10.4	K34	110	12
MAR										
14...	1000	--	128	9.1	8.5	--	9.8	K12	71	13
APR										
17...	1000	--	218	7.9	16.0	--	9.2	30	96	14
MAY										
09...	1100	150	740	8.4	14.0	--	8.8	24	340	80
JUN										
13...	1000	92	856	6.3	24.0	--	6.8	K15	340	81
JUL										
11...	1530	76	980	8.0	26.0	2	3.3	K7	350	80
AUG										
10...	1400	149	720	8.2	27.5	17	8.7	24	300	58
SEP										
27...	1345	93	1060	6.4	22.0	--	6.0	K4	350	77
342452111465100 - VERDE R. AT BROWNS SPRINGS FORD NR CAMP VERDE,AZ (LAT 34 24 52 LONG 111 46 51)										
JUN , 1979										
12...	1700	98	840	--	28.0	--	--	--	330	84
342146111424800 - VERDE R. ABV VERDE HOT SPRINGS NR CAMP VERDE,AZ. (LAT 34 21 46 LONG 111 42 48)										
JUN , 1979										
12...	1100	93	822	8.2	--	--	--	--	330	100
342053111415300 - VERDE R. 300' BEL CHILDS PP NR CAMP VERDE,AZ. (LAT 34 20 53 LONG 111 41 53)										
JUN , 1979										
12...	1600	138	790	8.1	--	--	--	--	340	110
342311111393300 - FOSSIL CR NR IRVING PP NR CAMP VERDE,AZ (LAT 34 23 11 LONG 111 39 33)										
JUN , 1979										
12...	0845	.78	1780	7.5	--	--	--	--	1200	960
09507500 - FOSSIL CR DIV TO CHILDS PP NR CAMP VERDE, ARIZ. (LAT 34 22 06 LONG 111 39 56)										
SEP , 1967										
14...	1400	43	761	7.5	23.0	--	--	--	410	18

DATE	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)	SODIUM AD-SORP-TION RATIO	POTAS-SIUM, DIS-SOLVED (MG/L AS K)	BICAR-BONATE (MG/L AS HCO3)	CAR-BONATE (MG/L AS CO3)	SULFATE DIS-SOLVED (MG/L AS SO4)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	FLUO-RIDE, DIS-SOLVED (MG/L AS F)
09506000 - VERDE RIVER NEAR CAMP VERDE, ARIZ. (LAT 34 27 00 LONG 111 47 00)										
JUL , 1976										
08...	61	54	78	1.8	5.2	319	0	210	48	.4
SEP										
01...	56	47	60	1.4	4.8	316	0	150	53	.4
OCT										
06...	53	38	40	1.0	3.2	282	0	80	24	.2
NOV										
08...	57	38	41	1.0	3.1	325	0	79	24	.4
APR , 1977										
01...	53	35	35	.9	2.7	310	0	63	13	.5
JUN										
22...	61	49	65	1.5	4.4	330	0	140	42	.4
OCT										
04...	58	35	36	.9	3.4	300	0	74	23	.3
OCT , 1978										
10...	60	47	62	1.5	4.1	340	0	150	38	.5
NOV										
14...	27	13	10	.4	3.1	130	0	18	7.7	.1
DEC										
12...	55	33	30	.8	2.6	300	0	62	19	.2
JAN , 1979										
17...	17	5.8	4.4	.2	1.5	63	--	16	2.5	.1
FEB										
14...	25	12	8.8	.4	1.3	120	1	15	5.9	.1
MAR										
14...	17	7.0	4.8	.2	.8	71	0	9.1	2.8	.1
APR										
17...	22	10	7.6	.3	1.1	100	0	16	4.6	.1
MAY										
09...	70	39	43	1.0	3.5	260	25	130	29	.3
JUN										
13...	60	47	60	1.4	4.5	320	0	160	38	.3
JUL										
11...	58	50	67	1.6	5.2	330	0	200	49	.4
AUG										
10...	54	41	47	1.2	4.9	300	0	140	35	.3
SEP										
27...	60	48	65	1.5	4.2	--	--	170	39	.4
342452111465100 - VERDE R. AT BROWNS SPRINGS FORD NR CAMP VERDE,AZ (LAT 34 24 52 LONG 111 46 51)										
JUN , 1979										
12...	58	45	59	1.4	4.7	300	--	150	39	.2
342146111424800 - VERDE R. ABV VERDE HOT SPRINGS NR CAMP VERDE,AZ. (LAT 34 21 46 LONG 111 42 48)										
JUN , 1979										
12...	56	45	56	1.4	4.4	270	0	160	37	.2
342053111415300 - VERDE R. 300' BEL CHILDS PP NR CAMP VERDE,AZ. (LAT 34 20 53 LONG 111 41 53)										
JUN , 1979										
12...	60	45	55	1.3	4.3	280	0	150	35	.3
342311111393300 - FOSSIL CR NR IRVING PP NR CAMP VERDE,AZ (LAT 34 23 11 LONG 111 39 33)										
JUN , 1979										
12...	240	140	33	.4	5.3	260	0	980	16	.3
09507500 - FOSSIL CR DIV TO CHILDS PP NR CAMP VERDE, ARIZ. (LAT 34 22 06 LONG 111 39 56)										
SEP , 1967										
14...	110	36	--	--	--	480	0	14	9.5	.1

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

DATE	SILICA, DIS-SOLVED (MG/L AS SIO2)	SOLIDS, RESIDUE AT 180 DEG. C DIS-SOLVED (MG/L)	SOLIDS, SUM OF CONSTI-TUENTS, DIS-SOLVED (MG/L)	SOLIDS, DIS-SOLVED (TONS PER AC-FT)	NITRO-GEN, NO2+NO3 TOTAL (MG/L AS N)	NITRO-GEN, NO2+NO3 DIS-SOLVED (MG/L AS N)	NITRO-GEN, AM-MONIA + ORGANIC TOTAL (MG/L AS N)	NITRO-GEN, TOTAL (MG/L AS N)	PHOS-PHORUS, TOTAL (MG/L AS P)	PHOS-PHORUS, ORTHO, DIS-SOLVED (MG/L AS P)
09506000 - VERDE RIVER NEAR CAMP VERDE, ARIZ. (LAT 34 27 00 LONG 111 47 00)										
JUL , 1976										
08...	36	593	651	.81	--	.17	--	--	--	.04
SEP										
01...	30	553	537	.75	--	.01	--	--	--	.02
OCT										
06...	26	379	404	.52	--	.00	--	--	--	.02
NOV										
08...	24	440	427	.60	--	.01	--	--	--	.02
APR , 1977										
01...	22	395	377	.54	--	.02	--	--	--	.01
JUN										
22...	34	566	559	.77	.18	.07	.17	.35	.050	.02
OCT										
04...	30	400	408	.54	.07	--	--	--	--	--
OCT , 1978										
10...	32	--	562	.76	.01	.02	.40	.41	.020	.01
NOV										
14...	15	172	160	.23	.26	.29	.68	.94	.330	.06
DEC										
12...	23	361	374	.49	.00	.15	.37	.37	.030	.01
JAN , 1979										
17...	11	--	91	.12	.19	.30	.60	.79	3.00	.06
FEB										
14...	16	--	145	.20	.09	.12	.49	.58	.090	.01
MAR										
14...	14	--	92	.13	.05	.09	.16	.21	.060	.03
APR										
17...	15	--	126	.17	.05	.00	.15	.20	.050	.03
MAY										
09...	25	--	494	.67	.07	.06	.12	.19	.010	.01
JUN										
13...	26	--	554	.75	.05	.00	.36	.41	.010	.00
JUL										
11...	35	618	628	.84	.01	.02	.33	.34	.010	.01
AUG										
10...	30	477	500	.65	.00	.01	.14	.14	.030	.01
SEP										
27...	33	--	582	.79	.07	.02	.46	.53	.040	.03
342452111465100 - VERDE R. AT BROWNS SPRINGS FORD NR CAMP VERDE,AZ (LAT 34 24 52 LONG 111 46 51)										
JUN , 1979										
12...	26	538	530	.73	--	.03	--	--	--	--
342146111424800 - VERDE R. ABV VERDE HOT SPRINGS NR CAMP VERDE,AZ. (LAT 34 21 46 LONG 111 42 48)										
JUN , 1979										
12...	25	508	517	.69	--	.00	--	--	--	--
342053111415300 - VERDE R. 300' BEL CHILDS PP NR CAMP VERDE,AZ. (LAT 34 20 53 LONG 111 41 53)										
JUN , 1979										
12...	24	475	512	.65	--	.00	--	--	--	--
342311111393300 - FOSSIL CR NR IRVING PP NR CAMP VERDE,AZ (LAT 34 23 11 LONG 111 39 33)										
JUN , 1979										
12...	23	1650	1570	2.24	--	.00	--	--	--	--
09507500 - FOSSIL CR DIV TO CHILDS PP NR CAMP VERDE, ARIZ. (LAT 34 22 06 LONG 111 39 56)										
SEP , 1967										
14...	18	--	424	.58	--	--	--	--	--	--

Table 14.--Chemical analyses of water from selected streamflow sites in the upper Verde River area—Continued

09506000 - VERDE RIVER NEAR CAMP VERDE, ARIZ. (LAT 34 27 00 LONG 111 47 00)

DATE	ARSENIC TOTAL (UG/L AS AS)	BARIUM, TOTAL RECOV-ERABLE (UG/L AS BA)	BORON, TOTAL RECOV-ERABLE (UG/L AS B)	BORON, DIS-SOLVED (UG/L AS B)	CADMIUM TOTAL RECOV-ERABLE (UG/L AS CD)	CHRO-MIUM, TOTAL RECOV-ERABLE (UG/L AS CR)	COPPER, TOTAL RECOV-ERABLE (UG/L AS CU)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)	LEAD, TOTAL RECOV-ERABLE (UG/L AS PB)
JUL , 1976										
08...	--	--	--	300	--	--	--	--	10	--
SEP										
01...	--	--	--	280	--	--	--	--	10	--
OCT										
06...	--	--	--	180	--	--	--	--	10	--
NOV										
08...	--	--	--	180	--	--	--	--	20	--
APR , 1977										
01...	--	--	--	160	--	--	--	--	10	--
JUN										
22...	28	0	300	250	<10	10	10	480	110	<100
OCT										
04...	--	--	--	180	--	--	--	--	110	--
OCT , 1978										
10...	23	0	360	300	0	0	11	350	<10	3
NOV										
14...	10	200	150	70	2	10	23	6900	80	34
DEC										
12...	17	100	180	150	5	30	6	570	0	50
JAN , 1979										
17...	20	800	420	70	3	60	110	47000	350	96
FEB										
14...	10	100	120	90	5	0	20	3400	20	50
MAR										
14...	5	100	100	50	15	20	12	1300	710	86
APR										
17...	8	100	90	100	1	0	11	630	20	31
MAY										
09...	15	100	340	210	12	10	2	150	20	150
JUN										
13...	18	100	300	300	1	0	5	180	10	27
JUL										
11...	21	100	400	530	0	10	24	90	10	13
AUG										
10...	19	100	250	250	0	10	4	540	<10	2
SEP										
27...	23	100	360	300	0	10	2	570	<10	4
342452111465100 - VERDE R. AT BROWNS SPRINGS FORD NR CAMP VERDE,AZ (LAT 34 24 52 LONG 111 46 51)										
JUN , 1979										
12...	--	--	--	230	--	--	--	--	10	--
342146111424800 - VERDE R. ABV VERDE HOT SPRINGS NR CAMP VERDE,AZ. (LAT 34 21 46 LONG 111 42 48)										
JUN , 1979										
12...	--	--	--	200	--	--	--	--	0	--
342053111415300 - VERDE R. 300' BEL CHILDS PP NR CAMP VERDE,AZ. (LAT 34 20 53 LONG 111 41 53)										
JUN , 1979										
12...	--	--	--	240	--	--	--	--	0	--
342311111393300 - FOSSIL CR NR IRVING PP NR CAMP VERDE,AZ (LAT 34 23 11 LONG 111 39 33)										
JUN , 1979										
12...	--	--	--	40	--	--	--	--	10	--
09507500 - FOSSIL CR DIV TO CHILDS PP NR CAMP VERDE, ARIZ. (LAT 34 22 06 LONG 111 39 56)										
SEP , 1967										
14...	--	--	--	--	--	--	--	--	--	--

DATE	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)	MERCURY TOTAL RECOVERABLE (UG/L AS HG)	SELENIUM, TOTAL (UG/L AS SE)	SILVER, TOTAL RECOVERABLE (UG/L AS AG)	ZINC, TOTAL RECOVERABLE (UG/L AS ZN)	CARBON, ORGANIC TOTAL (MG/L AS C)	CYANIDE TOTAL (MG/L AS CN)	PHENOLS (UG/L)
09506000 - VERDE RIVER NEAR CAMP VERDE, ARIZ. (LAT 34 27 00 LONG 111 47 00)									
JUL , 1976									
08...	--	--	--	--	--	--	--	--	--
SEP									
01...	--	--	--	--	--	--	--	--	--
OCT									
06...	--	--	--	--	--	--	--	--	--
NOV									
08...	--	--	--	--	--	--	--	--	--
APR , 1977									
01...	--	--	--	--	--	--	--	--	--
JUN									
22...	40	20	.3	3	<10	20	1.7	.00	4
OCT									
04...	--	--	--	--	--	--	--	--	--
OCT , 1978									
10...	30	6	.0	2	0	20	2.3	.00	3
NOV									
14...	160	0	.0	1	0	40	13	.00	2
DEC									
12...	60	9	.0	1	0	30	1.8	.00	3
JAN , 1979									
17...	1900	30	.1	0	1	180	43	.00	2
FEB									
14...	100	5	.0	1	1	50	--	.00	1
MAR									
14...	40	40	--	0	0	30	4.2	.00	2
APR									
17...	30	3	.0	0	0	30	--	.00	0
MAY									
09...	20	10	.2	2	0	30	--	.00	1
JUN									
13...	30	10	.0	2	0	30	5.6	.00	0
JUL									
11...	20	3	.1	2	0	60	2.4	.00	4
AUG									
10...	30	4	.1	2	0	10	1.9	.00	2
SEP									
27...	30	8	.2	2	0	10	--	.00	2
342452111465100 - VERDE R. AT BROWNS SPRINGS FORD NR CAMP VERDE,AZ (LAT 34 24 52 LONG 111 46 51)									
JUN , 1979									
12...	--	--	--	--	--	--	--	--	--
342146111424800 - VERDE R. ABV VERDE HOT SPRINGS NR CAMP VERDE,AZ. (LAT 34 21 46 LONG 111 42 48)									
JUN , 1979									
12...	--	--	--	--	--	--	--	--	--
342053111415300 - VERDE R. 300' BEL CHILDS PP NR CAMP VERDE,AZ. (LAT 34 20 53 LONG 111 41 53)									
JUN , 1979									
12...	--	--	--	--	--	--	--	--	--
342311111393300 - FOSSIL CR NR IRVING PP NR CAMP VERDE,AZ (LAT 34 23 11 LONG 111 39 33)									
JUN , 1979									
12...	--	--	--	--	--	--	--	--	--
09507500 - FOSSIL CR DIV TO CHILDS PP NR CAMP VERDE, ARIZ. (LAT 34 22 06 LONG 111 39 56)									
SEP , 1967									
14...	--	--	--	--	--	--	--	--	--

Table 15.--Modified drillers' logs of selected wells in the upper Verde River area

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
		(A-13-5)5bdc			
QUATERNARY:			TERTIARY:		
Alluvium:			Verde Formation:		
Soil	8	8	Soft, white clay with layers of soft lime	31	63
Hard-packed caliche	4	12	Hard crystallized lime; first water	5	68
Sand and gravel	8	20	Hard lime with layers of soft lime	52	120
Boulders, basalt	9	29			
Sand, coarse, clean	3	32			
		(A-13-5)5dab1			
QUATERNARY:			Very hard, white lime; first water at 66 feet, bailed 10 gallons per minute	7	66
Alluvium:			Medium-hard, yellow lime	4	70
Adobe	6	6	Hard, white lime	6	76
Boulders and gravel	7	13	Very hard, white lime	9	85
Brown clay	21	34	Soft, yellow lime	3	88
Red, sandy clay	2	36	Hard, yellow lime	3	97
Sand and gravel in brown clay	6	42	Very hard, white lime; second water at 99 feet, static water level 45 feet, bailed 20 gallons per minute with drawdown to 53 feet	2	99
TERTIARY:			Medium hard, yellow lime	1	100
Verde Formation:					
Bentonite	1	43			
Hard, white lime	7	50			
Medium hard, white lime	9	59			
		(A-13-5)6bbd2			
QUATERNARY:			Rock, reported salt at 250 feet, cemented back to 230 feet; static water level 60 feet, bailed 30 gallons per minute with 40 feet of drawdown	80	260
Alluvium:					
Soil	20	20			
Sand and gravel	48	68			
TERTIARY:					
Verde Formation:					
Blue clay	112	180			
		(A-13-5)6dbc			
QUATERNARY:			Hard, blue lime	22	70
Alluvium:			Blue clay, no odor	15	85
Sandy silt	14	14	Hard blue lime; first water at 115 feet, 5 gallons per minute; second water at 138 feet, 15 gallons per minute; static water level 25 feet, bailed 15 gallons per minute with drawdown to 40 feet	55	140
Sand, gravel, and boulders, no top water	5	19			
TERTIARY:					
Verde Formation:					
Blue clay, bad odor	29	48			
		(A-13-5)6dbd			
QUATERNARY:			TERTIARY:		
Alluvium:			Verde Formation:		
Soil	5	5	Medium-hard, white lime	6	21
Caliche	4	9	Hard, green lime	19	40
Boulders	6	15	Hard, blue lime; first water at 46 feet, static water level 28 feet, bailed 10+ gallons per minute with drawdown to 35 feet	8	48
		(A-13-5)7bab			
QUATERNARY:			TERTIARY:		
Alluvium:			Verde Formation:		
Silt	4	4	Blue clay; bailed 20 gallons per minute with no drawdown, water stands at 20 feet	5	37
Gravel and rock; first water at 20 feet	18	22			
Sand, rock, brown clay	10	32			
		(A-13-5)8bda1			
QUATERNARY:			TERTIARY:		
Alluvium:			Verde Formation:		
Adobe soil	6	6	Soft, white lime	7	34
Hardpan	2	8	Very hard lime	13	47
Sandy soil	10	18	Soft, blue lime; bailed 30 gallons per minute with no drawdown	3	50
Boulders and gravel	9	27			
		(A-13-5)8caa2			
QUATERNARY:			TERTIARY:		
Alluvium:			Verde Formation:		
Sandy silt	17	17	Blue clay	10	40
Boulders, sand, and gravel; first water	13	30	Blue clay, bad odor; static water level 13 feet, bailed 80 gallons per minute with no drawdown		

(A-13-5)8cdb

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Soil	16	16
Sand and gravel	4	20
Boulders	3	23
Sand and gravel	3	26
Boulders; first water at 26 feet	2	28
Sand	4	32
Sand and gravel	2	34
Boulders; second water at 34 feet	3	37
Sand	3	40
Sand	5	45
TERTIARY:		
Verde Formation:		
Blue clay; static water level 25 feet, bailed 25 gallons per minute with 3 feet of drawdown	3	48

(A-13-5)9cab

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Boulders and fill	25	25
TERTIARY:		
Verde Formation:		
Limestone; water at 62 feet	37	62
Limestone; water at 110 feet, static water level 55 feet	48	110
Hard, white limestone; water at 130 feet, static water level 55 feet	20	130
Hard limestone	55	185
Sodium sulfate, salty, plugged hole to 175 feet; bailed 30 minutes, salt very faint	5	190

(A-13-5)10bca

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Clay and white rock	250	250
Alternating layers of clay (25-30 feet thick) and sodium rock (10-15 feet thick)	550	800
Clay and lava rocks; water at 1,000 feet	600	1,400
Volcanic rocks:		
Igneous rocks	225	1,625

(A-13-5)11dab

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Topsoil of lakebed	6	6
TERTIARY:		
Verde Formation:		
Bentonite clay layer	5	11
Gypsum	79	90
Cavity	5	95
Gypsum	55	150

(A-13-5)12ccd

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Topsoil, brown dirt	6	6
Gravel and boulders	20	26
TERTIARY:		
Verde Formation:		
Brown clay	9	35
Blue clay and limestone layers; first water at 41 feet	10	45
Brown clay conglomerate	45	90
White limestone; second water at 90 feet	2	92
Hard conglomerate; static water level 8 feet	12	104

(A-13-5)14abd

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Brown clay	16	16
Sand and gravel	3	19
Fine sand and clay	2	21
Fine sand and boulders	7	28
Sand and boulders	18	46
Fine sand and gravel; first water at 48 feet	3	49
TERTIARY:		
Verde Formation:		
Brown clay and conglomerate	16	65
White clay	5	70
Conglomerate	12	82
Blue clay and limestone; second water at 88 feet	13	95

(A-13-5)15aaa

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Broken rock and boulder	30	30
TERTIARY:		
Verde Formation:		
Soft, blue clay	30	60
Hard, blue clay with crystallized gypsum, 97 percent salt solution	72	132

(A-13-5)15bda

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Soil	10	10
Boulders	5	15
Gravel	5	20
Sand	10	30
Boulders	5	35
TERTIARY:		
Verde Formation:		
White lime	2	37
Brown clay	2	39
White lime	1	40
Brown clay	2	42
White lime	3	45

(A-13-5)16aca

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			TERTIARY:		
Alluvium:			Verde Formation:		
Soil	15	15	Blue clay; second water at 65 feet with trickle gypsum; third water at 85 feet with trickle gypsum; fourth water at 100 feet with trickle gypsum, static water level 17 feet, bailed 75 gallons per minute with 5 feet of drawdown	65	110
Boulders	15	30			
Sand and gravel; water at 35-45 feet	15	45			

(A-13-5)16bad

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			TERTIARY:		
Alluvium:			Verde Formation:		
Sandy loam	10	10	Blue clay	10	45
Sand and gravel	10	20	Blue lime; water	5	50
Boulders	5	25	Blue clay; static water level 20 feet, bailed 30 gallons per minute with 35 feet of drawdown	10	60
Sand and gravel; water	10	35			

(A-13-5)17caa

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			TERTIARY:		
Alluvium:			Verde Formation:		
Soil	27	27	Blue clay; first water, bailed 25 gallons per minute with no drawdown		
Boulders	33	60			

(A-13-5)21cda

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Gravel; first water at 58 feet	9	67
Alluvium:			TERTIARY:		
Soil	20	20	Verde Formation:		
Boulders	4	24	Blue clay; static water level 35 feet, bailed 36 gallons per minute with no drawdown	3	70
Conglomerate	26	50			
Sand	8	58			

(A-13-5)21cdd

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Sand and gravel; first water at 68 feet	7	75
Alluvium:			Clay	15	90
Soil	20	20	Gypsum	25	115
Boulders	4	24	Blue lime; second water at 115 feet; third water at 195 feet, bailed 36 gallons per minute with 40 feet of drawdown	125	240
Conglomerate	26	50			
Gravel	8	58			
Sand	7	65			
TERTIARY:					
Verde Formation:					
Clay	3	68			

(A-13-5)26aaa

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Blue lime	40	380
Gravel:			Blue clay	10	390
Soil	2	2	Lime rock	5	395
Lime and boulders	14	16	Lime; water	15	410
TERTIARY:			Sandy conglomerate	60	470
Verde Formation:			Limestone	2	472
Light-brown clay	34	50	Sandy conglomerate	23	495
White lime	2	52	Limestone	1	496
Brown clay	38	90	Sandy conglomerate	19	515
Dark brown clay	35	125	Hard sandstone	2	517
Blue lime rock	2	127	Sandy conglomerate; from 410-560 feet, looked like creek gravel; always seemed to have water, static water level 395 feet, bailed 12 gallons per minute with 10 feet of drawdown	43	560
Light-brown lime	58	185			
Brown clay	40	225			
White lime	40	265			
Lime rock	3	268			
Blue clay	72	340			

(A-13-5)27cab1

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			TERTIARY:		
Alluvium:			Verde Formation:		
Soil	6	6	White clay	5	41
Red clay	15	21	Blue clay; static water level 24 feet, 15 gallons per minute with no drawdown	9	50
Big boulders; first water at 25 feet	7	28			
Sand and gravel	8	36			

(A-13-5)27dcb1

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Lime rock; some water at 42 feet	1	42
Alluvium:			Clay	48	90
Topsoil	28	28	Sandstone; static water level 42 feet, bailed 20 gallons per minute with drawdown to 100 feet	50	140
Gravel	12	40			
TERTIARY:					
Verde Formation:					
Clay	1	41			

	Thickness (feet)	Depth (feet)
(A-13-5)28dba		
QUATERNARY:		
Alluvium:		
Top fill	20	20
Sandy silt	18	38
Sand and gravel	2	40
Sand; water at 44 feet, static water level 40 feet, bailed 35 gallons per minute with no drawdown	15	55
(A-13-6)23bbc		
TERTIARY:		
Volcanic rocks:		
Gumbo and boulders	4	4
Red and yellow volcanic formation, very little variation in formation; first water at 318 feet increasing with depth but caving badly, best bail test 50 gallons per hour	596	600
(A-13-10)6ada		
PERMIAN:		
Kaibab Limestone:		
Broken lime rock	8	8
Solid lime rock	9	17
Solid limestone	137	154
Yellow clay mixed with sandstone gravel and some crystal gravel	4	158
Hard, sandy limestone, clay running in from 154-158 feet	112	270
Hard rock with some hard shells	173	443
Coconino(?) Sandstone:		
Light-yellow sandstone mixed with clay, more sand than clay; hit water in light sandy lime, more sand than lime at 474 feet	31	474
Sand with some hard shells, apparently all saturated, some caving	153	627
(A-13-10)24aad		
QUATERNARY:		
Surficial material:		
Overburden consisting of loose rock and clay	9	9
Clay, very muddy	15	24
Loose rock and decomposed limestone	3	27
PERMIAN:		
Kaibab Limestone:		
Limestone	39	66
Limestone with some soft decomposed zones, none more than 4 inches thick	53	119
Limestone	10	129
Very broken limestone and sandstone; some water	3	132
Coconino Sandstone:		
Sandstone	4	136
Mud with some hard zones	14	150
Very hard sandstone	66	216
Hard sandstone with traces of moisture	234	450
Soft sandstone, some moisture and clay; pea gravel and sandstone at 457 feet	7	457
Broken sandstone; water, the flow started between 456-457 feet and increased to 10-15 gallons per minute from 457-469 feet	12	469
Sandstone, quite hard and solid	21	490
Very soft and broken sandstone with some pea gravel	5	495
Soft, broken sandstone; no increase in water noted	65	560
(A-13-10)36ccc		
QUATERNARY:		
Surficial material:		
Claylike material, very soft and muddy	18	18
PERMIAN:		
Coconino Sandstone:		
Hard sandstone	28	46
Soft and wet sandstone, rust colored	25	71
Medium-hard sandstone	73	144
Wet, soft and broken sandstone	35	179
Hard, white sandstone	56	235
Medium-hard sandstone	62	297
Sandstone with some traces of moisture	99	396
Very soft and broken	5	401
Medium-hard sandstone	46	447
Soft and wet	11	458
Hard, white, dry sandstone	130	588
Very wet and broken sandstone; hole blowing water about 5 gallons per minute from 588 feet	17	605
Quite broken and soft; water increased to 10 gallons per minute at 605 feet	32	637
(A-13-11)18cba		
QUATERNARY:		
Surficial material:		
Overburden consisting of clay and gravel	5	5
PERMIAN:		
Kaibab Limestone:		
Limestone, quite hard and consistent	131	136
Broken, wet sandstone, very soft	15	151
Mud, clay and moisture	9	160
Broken limestone and sand	18	178
Clay, very muddy and sticky	17	195
Sandstone, quite consistent	28	223
Limestone	16	239
Limestone, decomposed zone at 251 feet	12	251
Coconino Sandstone:		
Sandstone	79	330
Hard sandstone; becoming quite damp at 415 feet	85	415
Hard, damp sandstone; very little evidence of water standing in hole after setting 8 hours	20	435
(A-14-3)17ddd2		
QUATERNARY:		
Alluvium:		
Soil with rocks	9	9
Decomposed granite	33	42
Crevice in rock	4	46
Solid decomposed granite	26	72
Broken up rocks on top of very hard granite	7	79
PRECAMBRIAN:		
Granite:		
(A-14-3)21abb		
QUATERNARY:		
Alluvium:		
Sand and gravel	15	15
Soft granite	40	55
PRECAMBRIAN:		
Granite rock; water at 72 feet, water level 35 feet	17	72

	Thick-ness (feet)	Depth (feet)		Thick-ness (feet)	Depth (feet)
(A-14-4)3bbd1					
QUATERNARY:			TERTIARY:		
Alluvium:			Verde Formation:		
Topsoil	24	24	Blue shale	74	112
Sand and gravel	14	38	Water-bearing limestone	38	150
(A-14-4)3dcb					
QUATERNARY:			Medium-hard, gray limestone	2	105
Alluvium:			Hard, gray limestone; second water at 151 feet, bailed 10 gallons per minute	46	151
Soil	2	2	Medium-hard, gray limestone	6	157
Big boulders	26	28	Very hard, gray limestone	13	170
TERTIARY:			Porous, gray limestone; third water at 170 feet, 15 gallons per minute, static water level 56 feet, bailed 15+ gallons per minute with 14 feet of drawdown	5	175
Verde Formation:					
Bentonite	4	32			
Blue clay	4	36			
Hard, gray limestone; first water at 103 feet, 2 gallons per minute	67	103			
(A-14-4)9aaa					
QUATERNARY:			White limestone, fractured zone; relatively strong water	20	185
Alluvium:			White limestone	114	299
Valley fill with boulders; very salty surface water	45	45	White limestone, small solution caverns; water	16	315
TERTIARY:			White limestone	267	582
Verde Formation:			White limestone; strong water	11	593
White limestone	9	54	White limestone	7	600
Blue clay; no water	111	165			
(A-14-4)10cbd					
Hand dug—No log	63	63	Cave full of black organic matter; water black and stinky at 216 feet	25	241
TERTIARY:			Soft, brown lime	12	253
Verde Formation:			Limestone; better water 253-270 feet, 30 gallons per minute, smells gypy	17	270
Blue clay	102	165			
White lime	45	210			
Hard, white lime	6	216			
(A-14-4)11bba					
QUATERNARY:			White limestone; third vein of water at 185 feet, small veins till 600 feet; at 600 feet, water stood at 30.5 feet; at 655 feet, water stood at 27 feet; at 688 feet, water dropped to 39 feet; lost all cuttings from 688-715 feet; at 755 feet, water stood at 35.7 feet; at 765 feet, water stood at 35 feet with no change to 800 feet	625	800
Alluvium:					
Valley fill with boulders; small vein of of water at 27 feet	27	27			
TERTIARY:					
Verde Formation:					
White limestone; slightly stronger water vein at 65 feet	38	65			
Blue clay	110	175			
(A-14-4)11daa2					
TERTIARY:			Limestone ledge	2	87
Verde Formation:			Lime clay	23	110
Lime clay and rock	25	25	Blue clay	5	115
River sand	5	30	Limestone	3	118
Lime clay	5	35	Clay and limestone	37	155
Clay bentonite	20	55	Limestone ledge	2	157
Clay and limestone	30	85	Lime clay and rock	28	185
(A-14-4)13bca2					
QUATERNARY:			Very hard, blue lime; first water	4	51
Alluvium:			Medium-hard, blue lime	19	70
Soil, gravel, and small boulders	9	9	Blue lime clay	17	87
Football-size boulders, gravel, sand	14	23	Hard, blue lime; second water	6	93
TERTIARY:			Medium-hard, blue lime	3	96
Verde Formation:			Hard, blue lime; maybe more water, static water level 26 feet, bailed 20+ gallons per minute with drawdown to 43 feet	4	100
Blue clay	10	33			
Medium-hard, blue lime	14	47			
(A-14-4)13bdd3					
QUATERNARY:			Medium-hard, gray lime	10	58
Alluvium:			Hard, gray lime; second water 75 feet, 12 gallons per minute	17	75
Sandy silt	7	7	Medium-hard, gray lime	2	77
Boulders	12	19	Hard, gray lime	20	97
TERTIARY:			Medium-hard, gray lime	14	111
Verde Formation:			Hard, gray lime; third water 113 feet, 20 gallons per minute	2	113
Blue clay	1	20	Medium-hard, gray lime; static water level 25 feet, bailed 20 gallons per minute with drawdown to 60 feet	2	115
Hard, white lime	14	34			
Medium-hard, gray lime	11	45			
Hard, gray lime; first water 48 feet, 2 gallons per minute	3	48			

(A-14-4)14adc2

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Hard, white lime	15	215
Alluvium:			Medium-hard, gray lime	10	225
Soil	9	9	Hard, gray lime	25	250
Boulders	11	20	Medium-hard, white lime	10	260
TERTIARY:			Hard, white lime	5	265
Verde Formation:			Medium-hard, white lime	3	268
Bentonite	15	35	Very hard, gray lime	2	270
Blue clay	89	124	Medium-hard, gray lime	2	272
Hard, blue lime	5	129	Hard, white lime	2	274
Soft, blue lime	6	135	Medium-hard, white lime; water, static water level 43 feet, bailed 20 gallons per minute with drawdown to 60 feet	6	280
Hard, blue lime	30	165			
Soft, blue lime	3	168			
Hard, blue lime; water at 168 feet	26	194			
Medium-hard, blue lime; water at 195 feet, static water level 47 feet, bailed 15 gallons per minute with drawdown to 58 feet	6	200			

(A-14-4)14dbc2

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Soft limestone, salt estimate 2 feet thick	25	110
Alluvium:			Gray clay, horrible odor of rotten eggs	45	155
Sandy soil and river rock	26	26	Soft stone and clay	10	165
River sand; first water	24	50	Clay and calcite crystals;-struck plenty water at 185 feet, static water level 50 feet	20	185
TERTIARY:					
Verde Formation:					
Gray clay, reacts to water like bentonite	35	85			

(A-14-4)14dcb1

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Soft, white lime	3	170
Alluvium:			Hard, white lime	55	225
Topsoil	5	5	Porous lime; first water	2	227
Boulders	16	21	Medium-soft lime; water level 65 feet, bailed 60 gallons per minute with 30 feet of drawdown	8	235
Sand and gravel	10	31			
TERTIARY:					
Verde Formation:					
Blue clay	136	167			

(A-14-4)15bcc

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Boulders, clay	15	130
Alluvium:			TERTIARY:		
Granite boulders	40	40	Verde Formation:		
Granite clay	20	60	Lime clay, thin rock ledges; bailed 50 gallons per minute, water cleared, bailed 75 gallons per minute, much sand entered well	80	210
Granite boulders; water at 90 feet, sour	50	110			
Sand, gravel	5	115			

(A-14-4)24acc1

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			TERTIARY:		
Alluvium:			Verde Formation:		
Sand	14	14	Blue clay; static water level 15 feet		
Gravel and boulders	29	43			

(A-14-4)24bba

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Sand and gravel	10	25
Alluvium:			Gravel and boulders	7	32
Soil	5	5	Sand and gravel	6	38
Sandy loam	4	9	Clay; bail test 50 gallons per minute with 2 feet of drawdown	7	45
Sand, some clay	3	12			
Sand	3	15			

(A-14-4)36ddb

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Hard lime	4	216
Alluvium:			Layers of soft and hard blue lime; second water 255-260 feet, water has bad odor and stands at 165 feet	44	260
Drift rock and boulders	12	12	Blue limestone	25	285
TERTIARY:			Crystallized limestone	12	297
Verde Formation:			White sandy lime	33	330
Conglomerate	8	20	White limestone; water stands at 170 feet, becomes brackish after setting overnight	20	350
White clay	140	160			
Blue clay; first water at 187 feet, very brackish	30	190			
Soft, white lime	22	212			

(A-14-5)1bbc2

	Thick-ness (feet)	Depth (feet)		Thick-ness (feet)	Depth (feet)
QUATERNARY:			Brown clay	3	173
Alluvium:			Hard, white lime; second water at		
Boulders	20	20	173 feet, 10 gallons per minute	2	175
TERTIARY:			Brown clay	21	196
Verde Formation:			Hard, white lime	4	200
Red clay	10	30	Brown clay	5	205
Hard, white lime	6	36	Hard, white lime	4	209
Brown clay	12	48	Brown clay	2	211
Hard, white lime	20	68	Hard, white lime; third water at 215 feet,		
Red clay	25	93	20 gallons per minute	9	220
Hard, white lime	5	98	Hard, white lime, with clay ribs 4 inches		
Red clay	7	105	thick; fourth water at 231 feet,		
Conglomerate, mostly clay	50	155	40 gallons per minute; fifth water at		
Hard, white lime; first water			239 feet, 50 gallons per minute;		
at 157 feet, 1 gallon per minute	15	170	flows at surface	20	240

(A-14-5)1cbb

	Thick-ness (feet)	Depth (feet)		Thick-ness (feet)	Depth (feet)
QUATERNARY:			Lime rock; water	2	35
Alluvium:			Brown clay	5	40
Soil	20	20	Lime rock; water	5	45
Sand and gravel	2	22	Brown clay	7	52
Boulders	3	25	White lime; water rock	5	57
Sand and gravel	2	27	Brown clay	63	120
Sand	2	29	White lime rock	10	130
TERTIARY:			Brown clay	50	180
Verde Formation:			Lime rock	8	188
Brown clay	4	33	Clay; water flows at surface	2	190

(A-14-5)2ada

	Thick-ness (feet)	Depth (feet)		Thick-ness (feet)	Depth (feet)
QUATERNARY:			Red clay	10	85
Alluvium:			Hard, white lime	2	87
Boulders, first water	20	20	Red clay	28	115
TERTIARY:			Conglomerate, mostly clay	26	141
Verde Formation:			Hard, white lime; first flow at 145 feet,		
Red clay	9	29	25 gallons per minute	10	151
Medium-hard, white lime	1	30	Red clay	2	153
Red clay	10	40	Medium-hard, white lime;		
Hard, white lime	10	50	second flow at 153 feet,		
Red clay	5	55	50 gallons per minute,		
Hard, white lime	20	75	flows at the surface	7	160

(A-14-5)2bad

	Thick-ness (feet)	Depth (feet)		Thick-ness (feet)	Depth (feet)
TERTIARY:			Lime rock; water	4	184
Verde Formation:			Red-brown clay	56	240
Lime rock	5	5	Lime rock	3	243
Light-brown clay	20	25	Light-brown clay	47	290
Lime rock	3	28	Hard, lime rock	5	295
Dark-brown clay	32	60	Brown clay	35	330
Hard lime rock	4	64	Dark-brown clay	65	395
Light-brown clay	46	110	Red-brown clay	25	420
Lime rock	7	117	Dark-brown clay	5	425
Dark-brown clay	15	132	Same lime rock	5	430
Hard lime rock; water	26	158	Malpais rock	45	475
Light-brown clay	22	180	Conglomerate, clay	50	525

(A-14-5)2ccd

	Thick-ness (feet)	Depth (feet)		Thick-ness (feet)	Depth (feet)
QUATERNARY:			Red clay	11	115
Alluvium:			Medium-hard, white lime; second water		
Brown clay	8	8	120 feet, 15 gallons per minute	10	125
Boulders, no top water	12	20	Red clay	18	143
TERTIARY:			Medium-hard, white lime;		
Verde Formation:			third water 143 feet;		
Red clay	18	38	static water level 35 feet,		
Hard, white lime; first water at			bailed 20 gallons per minute		
75 feet, 5 gallons per minute	66	104	with drawdown to 75 feet	7	150

(A-14-5)2cda

	Thick-ness (feet)	Depth (feet)		Thick-ness (feet)	Depth (feet)
QUATERNARY:			Brown clay with pink lime ribs	13	42
Alluvium:			Alternate layers brown and white		
Adobe	10	10	limestone; first water at 42 feet,		
Boulders	13	23	first flow at 80 feet, second flow		
TERTIARY:			at 158 feet, third flow at 170		
Verde Formation:			feet, fourth flow at 196 feet,		
Brown clay	1	24	flows at surface at about 30		
Hard, pink lime	5	29	gallons per minute	154	196

(A-14-5)2cdc

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Soil and small limestone rocks	21	21
Very soft limestone; first water at 21 feet	9	30
Limestone-type gravel	4	34
Sand and gravel	4	38
TERTIARY:		
Verde Formation:		
Medium-hard lime	2	40
Clay	6	46
Hard, porous lime	2	48
Clay	1	49
Hard, white lime	19	68
Soft, pink lime	14	82
Medium-hard, white lime; small amount water	3	85
Soft, brown lime	12	97
Very hard, white lime; more water about 1 gallon per minute	1	98
Soft, brown lime	37	135
Medium-hard, white lime	3	138
Medium-hard, brown lime	9	147
Soft, brown lime	12	159
Hard, brown lime	4	163
Medium-hard, brown lime	6	169
Very hard, white lime	15	184
Soft, red lime	9	193
Very hard, white lime; more water	16	209
Red clay with 4-10 inches hard lime layers	10	219
Alternate layers red clay and white lime 4-20 inches thick	36	255
Red clay	13	268
Soft, pink lime	2	270
Hard, white lime	10	280
Red clay; static water level 46 feet 2 inches, test bailed 20 gallons per minute with drawdown to 56 feet 2 inches	2	282

(A-14-5)3ccc

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
White lime rock	24	24
Yellow clay	88	112
Clay with hard streaks of lime	88	200
White clay	20	220
Yellow clay	20	240
White rock; water strata at 240 feet	5	245
Yellow clay with hard streaks of lime	5	250
White lime clay	25	275
Hard, shell lime; water strata at 285 feet	10	285
White lime clay; test bailed 20 gallons per minute, no drawdown	15	300

(A-14-5)4aaa

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Broken lime	22	22
Layers of lime 1 to 2 feet thick and clay 1 foot thick or less	233	255
Soft, white lime	70	325
Lime and bentonitic clay	35	360
Lime and bentonite	42	402
Bentonite	73	475
Layers of soft white lime and hard crystallized lime	14	489
Vuggy limestone, brown	14	503

(A-14-5)19dba2

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Soil	15	15
TERTIARY:		
Verde Formation:		
Brown clay	5	20
Sand and gravel	8	28
White lime	32	60
Brown clay	10	70
White lime rock	5	75
White lime; water at 75-80 feet, 90-100 feet, and 135-177 feet, static water level 70 feet, bailed 30 gallons per minute with no drawdown	102	177

(A-14-5)31dbd1

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Soil	7	7
Boulders	10	17
White clay	15	32
Red clay	2	34
Red sand	5	39
Gravel	11	50
TERTIARY:		
Verde Formation:		
Hard, yellow lime	20	70
Medium-hard, yellow lime	10	80
Soft, yellow lime	8	88
Hard, yellow lime	9	97
Medium-hard, yellow lime	20	117
Hard, white lime	8	125
Hard, yellow lime	20	145
Medium-hard, gray lime; first water at 180 feet, bailed 5 gallons per minute	49	194
Black onyx; second water 195 feet, static water level 130 feet, test bailed 15 gallons per minute with drawdown to 135 feet	7	201

(A-14-5)31dbd2

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Boulders	34	34
Gravel	5	39
TERTIARY:		
Verde Formation:		
Bentonite	37	76
Very hard, yellow lime	18	94
Medium-hard, yellow lime	46	140
Medium-hard, white lime	35	175
Cavity; first water at 175 feet, warm, bailed 10 gallons per minute	4	179
Medium-hard, green lime	6	185
Hard, blue lime	5	190
Hard, green lime	11	201
Medium-hard, green lime; second water at 201 feet, cool, static water level 139 feet, bailed 15 gallons per minute with no drawdown	4	205

(A-14-5)32bdc

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Medium-hard, blue lime	6	60
Alluvium:			Hard, blue lime, second water at 73 feet, 15+ gallons per minute	13	73
Soil	4	4	Medium-hard, blue lime; static water level 14 feet, bailed 15+ gallons per minute with drawdown to 26 feet	7	80
Boulders, no top water	6	10			
Sandy silt	6	16			
Boulders	6	22			
TERTIARY:					
Verde Formation:					
Hard, blue lime, first water at 54 feet, 10 gallons per minute	32	54			

(A-14-5)32cbb2

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
TERTIARY:			Soft layers of limestone with water-bearing strata	31	115
Verde Formation:			Dark lime with small streaks of white clay	10	125
Hard conglomerate	20	20	Soft, white lime with layers of clay	22	147
Soft, white lime	4	24	Streaked, soft, blue clay, no odor; water level reported at 69 feet		
Hard, crystallized lime with black streaks of lime	34	58			
Hard lime with soft layers of lime; first water at 69 feet	26	84			

(A-14-5)32dcc

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Hard, gray lime, water at 82 feet, 10 gallons per minute	33	90
Alluvium:			Medium-hard, white lime	16	106
Brown clay	20	20	Hard, white lime, water at 108 feet, 20 gallons per minute	2	108
Sand and gravel	8	28	Medium-hard, yellow lime	8	116
Boulders	8	36	Hard, white lime	7	123
Fine sand, top water at 40 feet, cased off	4	40	Medium-hard, gray lime, water at 125 feet, bailed 30 gallons per minute with drawdown to 34 feet, static water level 29 feet	7	130
TERTIARY:					
Verde Formation:					
Medium-hard, white lime, water at 50 feet, cased off	17	57			

(A-15-3)4dac

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Sandy, brown lime clay rock	20	120
Gravels:			Tan lime clay rock	30	150
Topsoil	1.5	1.5	Pink and white lime rock clay	5	155
Gravel and boulders	23.5	25	Brown lime rock clay	180	335
Clay	14	39	Pink and white clay and rock	35	370
Boulders	11	50	White lime rock	35	405
TERTIARY:			Red lime clay rock	35	440
Verde Formation:			White lime rock	175	615
Pink clay and sand	4	54	Red lime clay	10	625
Sandy lime, clay rock	6	60	Brown lime clay	5	630
Sandy, tan lime clay	10	70	Brown lime clay	30	660
Red, sandy lime clay	30	90	Red clay, white lime rock	80	740
Pink lime clay rock	10	100			

(A-15-3)10dcd

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Lime ledge	2	167
Gravels:			Lime, pink clay	48	215
Boulders	8	8	Lime ledge	2	217
TERTIARY:			Pink clay	113	330
Verde Formation:			Lime clay	30	360
Lime	10	18	Lime ledge	3	363
Lime ledges	30	48	Porous clay	7	370
Lime clay	67	115	Porous ledge	13	383
Pink clay	50	165	Lime clay	2	385

(A-15-3)11bab1

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Pink and white lime rock and clay	40	200
Gravels:			White lime rock and clay	50	250
Clay, sand, and boulders	30	30	Pink and white lime rock and clay	30	280
TERTIARY:			White lime rock and clay	80	360
Verde Formation:			Pink and white lime rock	5	365
Red clay	5	35	White lime rock	35	400
Pink and white lime rock and clay	55	90	Pink and white lime rock and clay	60	460
White lime rock	10	100	White lime rock	20	480
Red and white lime rock and clay	50	150	Pink and white lime rock and clay	120	600
White lime rock	10	160			

(A-15-3)12acc4

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Soil	17	17
Gravel	13	30
Sand	5	35
TERTIARY:		
Verde Formation:		
Brown clay	30	65
White lime rock	5	70
White lime rock; water	10	80
White lime rock	5	85
White lime rock; water	5	90
White lime rock	5	95
White lime rock, broken; water	10	105
White lime rock	5	110
White lime rock, broken; water	10	120
Brown clay	5	125
White lime rock	5	130
White lime rock, broken; water	5	135

(A-15-3)12bcb

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Soil	9	9
Sand and gravel	27	36
TERTIARY:		
Verde Formation:		
Alternate layers of red and white lime	87	123
Hard, white lime	8	131
Medium red lime	12	143
Very hard, white lime	48	191
Medium-hard, white lime	2	193
Hard, white lime	31	224
Soft, red lime	3	227
Hard, white lime	58	285
Same	5	290
Hard, white lime	38	328
Soft, red lime	1	329
Medium-hard, white lime	7	336
Hard, white lime	24	360

(A-15-3)15ccd

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Clay boulders	8	8
Clay	6	14
Red lime clay	33	47
Red lime rock	2	49
Red lime clay	6	55
Tan lime clay rock	20	75
Reddish-brown lime clay rock	70	145
Tan lime clay rock	20	165
Reddish-brown lime clay rock	150	315
Pink, white lime clay rock	10	325
Reddish-brown lime clay rock	85	410
White lime rock	4	414
Reddish-brown clay	71	485
Pink lime clay, white lime rock; static water level 480 feet	50	535

(A-15-4)2bca1

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Sandy soil	2	2
Sand, lime, gravel	42	44
Gravel and boulders	22	66
Sand clay conglomerate	16	82
Rock	2	84
Sandy clay	11	95
Rock	1	96
Sand clay conglomerate with rock ledges	57	153
Lime rock	3	156
Sand clay conglomerate	24	180
Hard conglomerate	10	190
Sand clay conglomerate	7	197
Hard rock	7	204
Conglomerate and clay ledges	36	240
Hard rock	16	256
Hard rock; bailed 80 gallons per minute with no drawdown	4	260

(A-15-4)2cbb2

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Soil	3	3
Hard, sandy soil	6	9
TERTIARY:		
Verde Formation:		
Sandy clay	22	31
Sandstone with layers of hard sandy clay	6	37
Boulders	1	38
Limestone conglomerate; first water	11	49
Decomposed basalt	7	56
Hard sandstone	6	62
Decomposed basalt	14	76
Medium-hard sandstone; second water	4	80
Decomposed basalt	33	113
Very soft sandstone	5	118
Medium-hard basalt	3	126
Soft basalt with sand mixed with layers of medium-hard to hard sandstone 6-18 inches thick; third water at 165 feet, fourth water at 180 feet, static water level 63 feet, test bailed 20 gallons per minute with drawdown to 93 feet	59	185

(A-15-4)2ccb4

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Topsoil	3	3
Rock and boulders	15	18
Clay	7	25
Limestone	10	35
Lime clay	2	37
Quicksand	48	85
Quicksand and conglomerate	8	93
Limestone	3	96
Clay	22	118
Limestone	2	120
Conglomerate, sandstone	13	133
Limestone	2	135
Sticky clay to lime, quicksand	160	295
Sandstone layer; static water level 85 feet, bailed 40 gallons per minute with drawdown to 180 feet	5	300

(A-15-4)3aca

	Thickness (feet)	Depth (feet)
No log; caved well, redrilled	258	258
TERTIARY:		
Verde Formation:		
Conglomerate, mostly clay	52	310
Decomposed basalt	18	328
Sandstone	19	347
Conglomerate, mostly clay	18	365
Basalt	61	426
Red gumbo clay	14	440
Sandstone ribs 2 inches thick in red clay	10	450
Conglomerate, mostly clay	15	465
Gumbo red clay	10	475
Conglomerate, mostly clay	13	488
Basalt	19	507
Black, porous, medium-hard rock	3	510
Red gumbo clay	33	543
Crack in earth; artesian flow 200 gallons per minute	2	545

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
(A-15-4)3bbc					
QUATERNARY:			Soft sandstone	21	131
Alluvium:			Very hard sandstone	6	137
Soil	4	4	Blow sand	11	148
Conglomerate	15	19	Hard sandstone	5	153
Soil	2	21	Blow sand	5	158
Boulders	3	24	Soft sandstone	7	165
Conglomerate	7	31	Hard sandstone with lime	1	166
Soil with gravel	16	47	Blow sand with lime and sandstone ledges 4-10 inches thick	14	180
TERTIARY:			Medium-hard sandstone	23	203
Verde Formation and volcanic rocks (undifferentiated):			Blow sand	3	206
Basalt	4	51	Hard, white lime	21	227
Blow sand	3	54	Clay	1	228
Soft sandstone	12	66	Hard sandstone	5	233
Basalt	1	67	Clay	3	236
Soft sandstone	29	96	Alternate layers, hard and soft sandstone; test bailed 40 gallons per minute with no drawdown	14	250
Blow sand	2	98			
Soft sandstone	9	107			
Blow sand	3	110			
(A-15-4)3bda					
QUATERNARY:			Sticky, red clay	4	170
Alluvium:			Hard limestone	10	180
Fill	8	8	Sticky clay	5	185
Boulders, lime-filled	42	50	Hard limestone	5	190
TERTIARY:			Fine sand	25	215
Verde Formation:			Limestone with red clay	5	220
Fine sand	50	100	Hard limestone	10	230
Soft, red sandstone	40	140	Yellow, porous limestone; static water level 32 feet, bailed 40 gallons per minute with no drawdown	5	235
Fine sand	15	155			
Sticky, red clay	9	164			
Hard limestone	2	166			
(A-15-4)3dab2					
QUATERNARY:			Quicksand and clay	181	220
Surficial material:			Hard limestone; water at 225 feet	5	225
Boulders	8	8	Clay	28	253
TERTIARY:			Hard sandstone; water at 257 feet	4	257
Verde Formation:			Clay; static water level 80 feet, bailed 27 gallons per minute with drawdown to 100 feet	3	260
Clay and sand	10	18			
Sand and clay washes	16	34			
Sandstone ledge	5	39			
(A-15-4)3dda2					
QUATERNARY:			Blow sand; second water	6	74
Surficial material:			Basalt	10	84
Soil	4	4	Sandstone	12	96
Sand, gravel, and boulders	4	8	Sandy clay	4	100
TERTIARY:			Sandstone	7	107
Verde Formation and volcanic rocks (undifferentiated):			Blow sand	2	109
			Basalt	7	116
White lime	20	28	Hard sandstone	6	122
Blow sand; first water	23	51	Basalt; third water, static water level 52 feet, bailer test 20 gallons per minute with drawdown to 72 feet	19	141
Gray clay	5	56			
Gray conglomerate	12	68			
(A-15-4)4aab					
QUATERNARY:			Quicksand	40	70
Alluvium:			Layers of clay and sand	48	118
Boulders	27	27	Lime	1	119
TERTIARY:			Coarse sand, volcanic conglomerate	6	125
Verde Formation:			Soft volcanic rock; flow produced 338 gallons per minute	120	245
Sandy; first water	3	30			
(A-15-4)7ccb					
QUATERNARY:			Pink lime clay	19	64
Alluvium:			White lime rock	2	66
Boulders	10	10	Pink lime clay	14	80
TERTIARY:			Red lime clay	20	100
Verde Formation:			Pink lime clay	10	110
White lime rock	14	24	White lime rock	15	125
Red lime clay	6	30	Red lime clay	10	135
Pink lime clay	5	35	White lime rock	10	145
Red lime clay	5	40	White lime clay; static water level 55 feet	10	155
White lime rock	5	45			

(A-15-4)9add

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Clay	280	280
Limestone and quicksand, cavern at 378 feet; water flows at surface	98	378

(A-15-4)9dad2

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Sandy soil	2	2
Soft, lime rock	3	5
Sand	10	15
Sandstone	3	18
Sand	12	30
Sandstone	5	35
Red sandstone	50	85
Lime rock	5	90
Lime rock, sand; static water level 85 feet	110	200

(A-15-4)10dca2

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Soil and boulders	8	8
TERTIARY:		
Verde Formation:		
Hard, white conglomerate with large boulders	13	21
Red conglomerate	11	32
Sandy clay with 2- to 4-inch layers of sandstone and red clay	18	50
Soft, red sandstone	3	53
Hard, red sandstone	7	60
Red conglomerate; first water	7	67
Very hard, white sandstone	7	74
Soft conglomerate	12	86
Very hard, white sandstone	5	91
Medium-soft, red sandstone	3	94
Very hard, white sandstone	3	97
Sandy clay with 2- to 4-inch layers of hard sandstone	19	116
Hard sandstone	5	121
Soft, sandy clay	1	122
Hard, red sandstone	7	129
Red conglomerate	9	138
Soft, red sandstone	21	159
Hard, red sandstone	4	163
Blow sand	4	167
Soft sandstone	2	169
Hard sandstone	5	174
Red conglomerate	8	182
Gray conglomerate	2	184
Soft, red sandstone with river run sand, sand filled last 8 feet; static water level 51 feet, bailed 33 gallons per minute	4	188

(A-15-4)11bbd3

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Sand	1	1
Lime sand	14	15
Limestone and sand	25	40
Limestone	15	55
Sand	20	75
Limestone	10	85
Sand	35	120
Limestone	5	125
Sand	13	138
Lime sandstone	8	146
Sandstone and sand	36	182
Rock	1	183
Sand	2	185
Rock	1	186
Conglomerate	54	240

(A-15-4)12abb

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Red, alluvial sand	35	35
Fine, red sand	30	65
Light-red sand with chips of dense limestone	25	90
Red sand and clay	40	130
Brown sand with blue-gray clay	37	167
Red sand and clay	63	230
Red sand and clay conglomerate	65	295
Red conglomerate	175	470
Basalt with sticky mud	30	500
Red sandstone mixture	10	510
Clay, very sticky	27	537
Red sandstone or sand	28	565
Sticky clay	5	570
Red sandstone or sand	15	585
Sandy conglomerate	25	610
Clay	17	627
Red sandstone or sand	3	630
Yellow, sandy clay	20	650
Pink clay and sand	55	705
Gray clay and sand	15	720
Clay and limestone	10	730
Basalt or lime	8	738
Shale and clay	10	748
Blue and yellow clay	3	751
Basalt or lime	7	758
Clay and shale	17	775
Clay	35	810
Clay and shale	65	875
PERMIAN AND PENNSYLVANIAN:		
Supai Formation:		
Red Supai	71	946

(A-15-4)15aca

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Soft Verde limestone	34	34
Red clay	5	39
Verde limestone with hard shells	41	80
Very hard limestone; water at 80 feet	10	90
Limestone with hard shells	35	125
Light-pink sandstone	10	135
Red clay	25	160
Red sandstone	25	185
Hard limestone with pockets of blue clay; static water level 4 feet	10	195
Hard limestone; water flowing at 0.1 gallon per minute	20	215
Blue, sticky clay	10	225
Very hard limestone; water flowing at 100 gallons per minute at 275 feet	60	285
Hard limestone; water flowing about 150 gallons per minute	5	290
Blue, sticky clay; water flows at surface	10	300

(A-15-4)15dac

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Sand	10	10
Sand, gravel, and boulders	20	30
Red lime clay rock	20	50
White lime clay rock	5	55
Pink lime clay rock	70	125
Sandy lime clay rock	10	135
Red lime clay rock	15	150
Sandy lime clay rock	47	197
White lime rock	8	205
Lime, sand, clay rock	65	270
Quicksand	10	280
Sandy clay, conglomerate	23	303
Sandstone	7	310
Sandstone ledges, sand and clay conglomerate; water flows at surface	140	450

(A-15-4)15dba

	Thick-ness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Sandy soil	6	6
Sand, gravel, and boulders	11	17
Clay with gravel	9	26
TERTIARY:		
Verde Formation:		
Medium-hard sandstone	22	48
Soft, red lime	11	59
Medium-hard, red lime	6	65
Hard, red lime	7	72
Soft, red lime	4	76
Very hard, red lime	2	78
Medium-hard, red lime	12	90
Medium-hard sandstone	12	102
Sandy clay; first artesian water 10 gallons per minute	21	123
Medium-hard red sandstone	6	129
Soft, red sandstone	8	137
Hard, red sandstone	1	138
Very hard, red sandstone	1	139
Hard, red sandstone layers 3-8 inches thick with layers of clay 10-30 inches thick	29	168
Medium-hard, red sandstone	4	172
Hard, red sandstone with thin layers of clay; some artesian at 180 feet, 5 gallons per minute	40	212
Hard, white sandstone	9	221
Hard, white sandstone with layers of very sticky clay	15	236
Hard, white sandstone	5	241
Crystallized lime	1	242
Hard sandstone; more artesian at 245 feet, 175 gallons per minute	4	246
Sticky clay conglomerate; water flows at surface	4	250

(A-15-4)17bdb

	Thick-ness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Red, sandy clay	55	55
Red clay	30	85
Yellow clay	7	92
Red clay	23	115
Hard, white lime rock	12	127
Soft clay	8	135
Hard rock	12	147
Soft rock	1	148
Hard, pink rock	3	151
Yellow clay	5	156
Soft clay	5	161
Soft, red clay	5	166
Soft clay	5	171
Hard and soft, red clay	5	176
Yellow lime and lime rock	5	181
Lime rock and clay	5	186
Yellow lime clay	5	191
Red clay	31	222
Yellow clay; first water at 238 feet	18	240
White lime clay	20	260
Hard lime clay; second water 267-285 feet	10	270
Lime	10	280
Red clay	5	285
Lime rock	5	290
Lime rock and yellow clay; static water level 238 feet, test bailed 22 gallons per minute with no drawdown	10	300

(A-15-4)18abb

	Thick-ness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Clay	2	2
Lime ledge	2	4
Hard conglomerate of rocks, sand, and clay	7	11
Sand and rock river run	6	17
Lime ledge	2	19
Clay	6	25
Lime ledge	8	33
Lime clay	12	45
Lime ledge	2	47
Lime clay	13	60
Lime ledge; some water	5	65
Pink clay; some water at 75 feet	25	90
Gumbo clay and lime ledge	35	125
Lime clay and lime ledge	55	180
Porous lime ledge and clay; static water level 200 feet	20	200

(A-15-4)18ddd2

	Thick-ness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
White limestone	80	80
Pink limestone	17	97
Limestone ledge	3	100
White limestone	47	147
Limestone ledge	5	152
Pink limestone	29	181
White limestone; static water level 105 feet	19	200

(A-15-4)19aad

	Thick-ness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Boulders	25	25
TERTIARY:		
Verde Formation:		
Lime and clay	23	48
Hard lime shell	1	49
Yellow clay	3	52
Hard lime rock; first water at 52 feet	4	56
Lime and clay; second water at 89 feet, static water level 45 feet, bailed 30 gallons per minute with 10 feet of drawdown	44	100

(A-15-4)22aba

	Thick-ness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Sandy soil	6	6
Gravel and boulders	6	12
TERTIARY:		
Verde Formation:		
Hard, white lime	8	20
Red clay and gravel	15	35
Soft, red lime	7	42
Red clay with gravel	8	50
Hard, white lime; first water, static water level 20 feet	8	58
Soft, clay and gravel	7	65
Hard, white lime	7	72
Hard, pale-red clay with gravel	13	85
Hard, white lime	7	92
Clay with gravel	11	103
Hard sandstone	11	114
Soft, pink lime with 2- to 4-inch layers of hard white lime	46	160
Hard sandstone; second water, static water level 14 feet	7	167
Soft sandstone with 6- to 18-inch layers of hard sandstone	18	185
Hard sandstone	11	196
Hard sandstone with 6- to 18-inch layers of soft sandstone; third water at 220 feet, static water level 2 feet	54	250
Hard sandstone with 6- to 24-inch layers of soft sandstone	38	288
Soft, yellow sandstone with gravel; fourth water	5	293
Yellow sandstone conglomerate	3	296
Gray conglomerate	4	300
Shelves of hard sandstone	18	318
Blow sand; flows at surface at 12 gallons per minute, bailed 70 gallons per minute with 50 feet of drawdown	4	322

(A-15-4)22bab

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Soil and boulders	9	9
TERTIARY:		
Verde Formation:		
Hard, white lime	2	11
Soft, pink	11	22
Hard, white	1	23
Soft, pink	7	30
Clay	3	33
Hard, sandstone ledge	1	34
Soft, pink lime	9	43
Hard, white	2	45
Clay; first water, static water level 38 feet	9	54
Hard, white lime; more water	8	62
Soft, pink	7	69
Very hard, white	9	78
Soft, pink	4	82
Hard, white	5	87
Soft, pink	23	110
Hard, white	4	114
Soft, pink; water between 114-124 feet, static water level 80 feet	8	122
Soft, pink	11	133
Hard, sandstone ledge	2	135
Soft, red lime	8	143
Hard, white lime	4	147
Soft, white lime	6	153
Hard, white lime; more water, static water level 75 feet	4	157
Soft, pink lime	3	160
Hard, white lime	5	165
Soft, red lime	2	167
Hard, white lime	11	178
Conglomerate	9	187
Clay	6	193
Soft, red lime	2	195
Hard, white lime	8	203
Soft, pink lime	4	207
Red and white honeycomb lime	13	220
Conglomerate	13	233
Hard, sandstone ledge	2	235
Sandy clay	23	258
Conglomerate; more water, static water level 14 feet 10 inches	10	268
Hard, white sandstone	4	272
Conglomerate	8	280
Sandy clay	18	298
Hard, white sandstone	4	302
Conglomerate; more water, static water 5 feet 11 inches	5	307
Sandy clay	11	318
Hard, white lime	6	324
Sandy clay	8	332
Hard, white sandstone with white crystals	5	337
Soft, red(?) sandstone; more water, overflow 2 gallons per minute	7	344
Medium-hard, white sandstone	2	346
Hard sandstone	1	347
Hard, white lime with crystals	3	350
Soft, sticky, sandy clay, blow sand at 367 feet; water at surface flowing 8.5 gallons per minute	17	367

(A-15-5)24dca

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Topsoil	20	20
Boulders and clay	60	80
Soapstone	30	110
Conglomerate	85	195
Black granite	20	215
Gravel and clay	85	300
Hard, gray granite	15	315
Gray clay, some gravel	30	345
Gray clay	15	360
PERMIAN AND PENNSYLVANIAN:		
Supai Formation:		
Red sandstone; water level reported 135 feet, test gave 200 gallons per minute but dropped off to 50 gallons per minute	38	398

(A-15-5)27ccc

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Clay and boulders	28	28
Brown clay; first water at 90 feet	62	90
Shale rock	30	120
Clay with lime streaks	180	300
Light-brown clay	52	352
Lime rock; main water at 360 feet	18	370

(A-15-5)28dda

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Soil and boulders	10	10
Boulders	6	16
Clay	3	19
Boulders	2	21
TERTIARY:		
Verde Formation:		
Chalk lime	19	40
Lime rock	5	45
Chalk	15	60
Chalk lime	10	70
Clay	20	90
Lime rock; first water at 95 feet, trickle	5	95
Clay and rock	45	140
Lime rock	5	145
Brown clay	5	150
Lime rock	5	155
Clay	10	165
Lime rock; second water at 175 feet	10	175
Clay	10	185
Lime rock	25	210
Clay	15	225
Rock; third water at 230 feet	5	230
Clay	5	235
Lime rock	5	240
Clay	35	275
Conglomerate	15	290
Rock	2	292
Clay	13	305
Rock	5	310
Broken rock; water at 315 feet	5	315
Hard rock; water at 325 feet	10	325
Clay	5	330
Broken rock; water 330-365 feet	35	365
Malpais	10	375

(A-15-5)35aac

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Topsoil	5	5
Lime	10	15
Clay	5	20
Lime	5	25
Clay	10	35
Lime, hard	15	50
Clay	25	75
Lime	5	80
Clay	45	125
Volcanic black malpais	10	135
Red clay and lime shells	50	185
Red shale	10	195
Hard lime; water, static water level 82 feet	15	210

Table 15.--Modified drillers' logs of selected wells in the upper Verde River area--Continued

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
(A-15-5)35bdd					
TERTIARY:			Red lime clay	25	95
Verde Formation:			White lime rock	5	100
Soil	6	6	White lime rock and clay	10	110
Lime rock	10	16	Red lime clay	40	150
Pink lime and clay	14	30	Pink and red lime rock and clay	10	160
Pink and white lime, clay and rock	5	35	Pink and white lime rock and clay	110	270
Pink and white lime clay	35	70	White lime rock; static water level 65 feet	35	305
(A-15-5)36ccc					
TERTIARY:			Brown clay	93	140
Verde Formation:			White lime rock; water	65	205
Soil	15	15	Brown clay	55	260
Brown clay	25	40	White lime rock; water	25	285
White lime rock; water	7	47	Brown clay	10	295
(A-15-6)21ddc					
QUATERNARY:			PERMIAN AND PENNSYLVANIAN:		
			Supai Formation:		
Surficial material:			Sandstone; water at 100 feet	88	100
Boulders	12	12	Sandstone; water, estimate 20 gallons per minute	20	120
(A-15-6)29caa					
TERTIARY:			Red sandstone; small stream water at 136 feet	18	147
Verde Formation:					
Boulders, gravel; some water	36	36	Brown shale; large stream water at 164 feet	17	164
Gravel, sand, clay	19	55			
PERMIAN AND PENNSYLVANIAN:			Thin layers of brown sandstone and shale	9	173
Supai Formation:			Hard lime	12	185
Red shale and Supai	38	93	Red shale	11	196
Red sandstone	28	121	Hard red shale	32	228
Bad cracks in brown sandstone	8	129	Fine sand and some clay	5	233
			Hard shale; flowing 2 gallons per minute	9	242
(A-15-6)31cba1					
QUATERNARY:			TERTIARY:		
Surficial material:			Verde Formation:		
Topsoil	16	16	Brown clay	16	59
Conglomerate of malpais boulders, sand, clay, and gravel	27	43	Limestone formation	25	84
			Soft, white sandstone	21	105
(A-16-3)17dbc					
QUATERNARY:			Clay	10	100
Alluvium:			Lime	15	115
Soil	15	15	Sandstone	5	120
Sand and gravel	10	25	Clay	20	140
TERTIARY:			Clay and soft, white lime	11	151
Verde Formation:			White and red clay, red sand	4	155
Soft lime	5	30	White limestone	10	165
Clay	3	33	Alternating brown limestone and red clay	70	235
Sand and gravel	4	37			
Clay and sand	9	46	White limestone	5	240
Lime	4	50	Red clay	12	252
Clay and sand	10	60	Limestone; large flow of water at 252 feet	2	254
White lime	5	65			
Clay and sand	15	80	Alternating limestone and sandstone	11	265
Soft, white lime; first water flow	10	90			
(A-16-3)20aba					
QUATERNARY:			TERTIARY:		
Surficial material:			Verde Formation:		
Sand, gravel, and boulders	47	47	Limestone ledges	9	96
			Clay	9	105
Sand and clay	13	60	Limestone	20	125
Sand and boulders	27	87	Limestone ledges; static water level 30 feet	25	150
(A-16-3)20ddc					
QUATERNARY:			Brown basalt	8	251
Surficial material:					
Soil, sand, boulders	22	22	Hard sandstone ledges with clay layers 6-18 inches thick	14	265
TERTIARY:			Sandstone basalt	13	278
Verde Formation:			Blow sand; first water	7	285
Hard, red sandstone	4	26	Medium-hard sandstone	13	298
Soil or sandstone with medium-hard ledges 2-18 inches thick	26	52	Sandy clay	16	314
Soil or sandstone with very hard ledges 2-10 inches thick	98	150	Medium-hard sandstone with clay layers 1-4 feet thick	24	338
Soft sandstone with hard ledges 1-10 feet thick	45	195	Hard white lime	5	343
			Sandy clay	8	351
			Bentonite	13	364
Soft sandstone with hard ledges 1-6 feet thick	36	231			
Very soft sandstone with very soft ledges between	12	243	Blow sand, sand filled hole to 345 feet; static water level 265 feet, bailed 13-14 gallons per minute with drawdown to 285 feet	1	365

(A-16-3)21bbb

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Hard rock and clay mix	24	24
River sand	4	28
TERTIARY:		
Verde Formation:		
Clay and limestone ledges	77	105
Quicksand	13	118
Clay conglomerate	15	133
Limestone	3	136
Clay conglomerate	4	140
Limestone; static water level 55 feet		

(A-16-3)21cdd

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Boulders	55	55
TERTIARY:		
Verde Formation:		
Red clay	7	62
Sandstone	1	63
Sandy clay	19	82
Clay and hard streaks	148	230
Sandy clay; first water at 237 feet	20	250
Sandstone	1	251
Sandy clay	2	253
Sandstone	0.5	253.5
Sticky clay	21.5	275
Red clay; more water at 296 feet	20	295
Lime rock	5	300
Lime clay; static water level 238 feet, bailed 12-15 gallons per minute with drawdown to 260 feet	5	305

(A-16-3)22bcc

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Topsoil, red, sandy	10	10
TERTIARY:		
Verde Formation:		
White limestone	11	21
Yellow clay	8	29
Limestone	2	31
Red clay	8	39
Limestone	6	45
Red clay	11	56
Yellow clay and lime	25	81
Lime rock	2	83
Yellow clay, lime formation	4	87
Red clay	20	107
Limestone	3	110
Red, sandy clay and silt, caving formation; water found unfit for use, cased off	31	141
Limestone	15	156
Hard, red clay	34	190
Yellow clay, lime formation	36	226
Limestone	4	230
Yellow clay	9	239
Limestone	4	243
Yellow clay	19	262
Honeycomb limestone; water strata	9	271
Yellow clay	9	280
White, lime clay	11	291
Yellow clay	22	313

(A-16-3)27ccd

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Topsoil	8	8
Clay and gravel	13	21
Sand and gravel	9	30
River sand gravel	31	61
Red clay conglomerate	7	68
TERTIARY:		
Verde Formation:		
Conglomerate, pink lime	7	75
White limestone	3	78
Conglomerate	20	98
Lime and clay ledges	39	137
Pink lime; static water level 45 feet	10	147

(A-16-3)28abd

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
River run	30	30
Rock and clay	5	35
TERTIARY:		
Verde Formation:		
Hard limestone	2	37
Rock and clay	8	45
Pink lime clay	45	90
Quicksand	15	105
Lime clay	40	145
Quicksand	10	155
Lime clay	10	165
Limestone	2	167
Lime clay	18	185
Quicksand	5	190
Clay conglomerate	45	235
Limestone and gravel	10	245
Flakey clay	5	250
Lime clay; static water level 105 feet	25	275

(A-16-3)29aad1

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Topsoil, boulders	28	28
TERTIARY:		
Verde Formation:		
Red silt	3	31
Brown clay	27	58
Clay ledges	14	72
Sandstone ledge	22	94
Brown clay	21	115
Conglomerate	50	165
Brown clay	25	190
Sandstone	4	194
Conglomerate	54	248
Quicksand	4	252
Brown clay	16	268
Conglomerate	33	301
Limestone ledges; static water level 115 feet	29	330

(A-16-3)29dbc

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Gravels:		
Boulders and dirt	15	15
River sand and rock	30	45
Clay and rock	10	55
Clay	32	87
Sand and clay mix	3	90
TERTIARY:		
Verde Formation:		
Limestone ledge	2	92
Sand and clay	13	105
Lime clay	20	125
Limestone	2	127
Pink, lime clay	68	195
Clay conglomerate	235	430
Limestone gravel	5	435
Limestone and clay	20	455
Sticky gumbo; static water level 145 feet		

	Thickness (feet)	Depth (feet)
(A-16-3)31dca		
QUATERNARY:		
Gravels:		
Alluvial fill	40	40
TERTIARY:		
Volcanic rocks:		
Blue basalt	30	70
Volcanic mud	2	72
Blue basalt	10	82
Cinders filled with red volcanic mud	9	91
Very hard, blue basalt	2	93
Sedimentary rocks:		
Red volcanic mud with traces of soft white lime; bailer test at 101 feet, 15 gallons per minute	3	96
Hard, gray lime with a soft, red filler	14	110
Red volcanic mud	15	125
Hard, gray limestone	11	136
Red volcanic mud	2	138
Limestone with red filler	23	161
Possible opening	1	162
MISSISSIPPIAN:		
Redwall limestone:		
Hard limestone, porous; water carried off cuttings, pump test at 200 feet, 250 gallons per minute with 3 feet of drawdown, static water level before test 11 feet 7 inches, after test 11 feet	38	200
Gray limestone with white filler; pump test at 225 feet in excess of 350 gallons per minute with 7 feet 4 inches of drawdown, static water level 11 feet 5 inches	25	225
(A-16-3)31ddc2		
QUATERNARY:		
Gravels:		
Soil	2	2
Soil and small boulders	25	27
Soil and large boulders	5	32
TERTIARY:		
Sedimentary rocks:		
Clay with small boulders	9	41
Large boulders	3	44
Medium-large boulders	2	46
Small boulders and soil	7	53
Volcanic rocks:		
Hard basalt	8	61
Boulders and soil	2	63
Gravel; first water 63-68 feet	5	68
Boulders	1	69
Decomposed basalt	7	76
Medium-hard basalt	12	88
Very hard basalt with small amount of clay; second water at 98 feet	63	151
Softer with more clay	6	157
Very hard basalt with less clay	4	161
Very, very hard basalt, no clay	4	165
Hard, red basalt with cinders	4	169
Very, very hard basalt, no clay	7	176
Softer basalt with clay	7	183
Harder basalt with clay	15	198
Very, very hard basalt, no clay; bailed 40 gallons per minute with drawdown to 52 feet, static water level 37 feet	2	200
(A-16-3)33dcd		
QUATERNARY:		
Gravels:		
Soil	4	4
Sand and rock	66	70
TERTIARY:		
Verde Formation:		
Pink clay	105	175
Lime	3	178
Brown clay	42	220
Pink clay	105	325
White lime	15	340
Pink clay	50	390
Lime ledge	5	395
Soft clay	2	397
Clay	51	448
White lime	2	450
Pink clay	15	465
Chalk lime	5	470
Pink clay	20	490
White lime ledges and clay; static water level 120 feet	110	600
(A-16-3)34aaa		
QUATERNARY:		
Gravels:		
Topsoil	6	6
Sand and gravel	23	29
TERTIARY:		
Verde Formation:		
Yellow clay	51	80
White lime clay and white lime rock; water strata 80-85 feet	5	85
Yellow clay; static water level 25 feet	15	100
(A-16-3)34ccd2		
QUATERNARY:		
Gravels:		
Sand, gravel, and boulders	80	80
Gravel and clay	35	115
TERTIARY:		
Verde Formation:		
Lime rock; water at 120 feet, 1 gallon per minute	5	120
Pink lime; water at 140 feet, 15 gallons per minute	20	140
White lime	5	145
Pink lime	15	160
White lime; water at 170 feet	10	170
White lime rock	5	175
Lime rock, white	25	200
Pink lime	200	400
White lime	80	480
Lime rock; main water at 480-560 feet	80	560
Clay	10	570
Pink lime	20	590
Lime and clay layers	40	630
(A-16-3)34ddb		
QUATERNARY:		
Gravels:		
Topsoil	22	22
Sand	14	36
Sand and gravel	4	40
Clay and gravel	23	63
TERTIARY:		
Verde Formation:		
Sandstone	7	70
Pink clay	14	84
White limestone	12	96
Red clay	4	100
White limestone	6	106
Red clay	12	118
White limestone	14	132
Limestone ledges	18	150
Red clay	6	156
Limestone	7	163
Red clay; static water level 85 feet	7	170

(A-16-3)36dac

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Lime ledge and clay	20	20
Lime ledges	2	22
Pink clay	106	128
Lime ledge	2	130
Lime ledge and clay	110	240
Clay and limestone; static water level 75 feet, bailed 40 gallons per minute with 160 feet of drawdown	25	265

(A-16-4)15ddc

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Topsoil and clay mix	15	15
Mud	3	18
Clay	37	55
River-run sand and rock	5	60
Clay and rock	5	65
TERTIARY:		
Volcanic rocks:		
Malpais rock	3	68
Clay and sandstone	3	71
Malpais rock; static water level 30 feet	1	72

(A-16-4)21aac

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation and volcanic rocks (undifferentiated):		
Gravelly topsoil	4	4
Brown clay	5	9
Boulders	5	14
Brown clay	6	20
Quicksand	25	45
Brown clay	13	58
Red and green limestone	4	62
Brown clay and shells	13	75
Malpais conglomerate	40	115
Gray, sandy lime	5	120
Solid malpais	38	158
Volcanic conglomerate	12	170
Pink and gray limestone and quartz	40	210
PERMIAN AND PENNSYLVANIAN:		
Supai Formation:		
Red sandstone	15	225
Pink water-bearing sandstone	50	275
Red sandstone	10	285
Pink water sand and hard shells	30	315
Red sandstone	25	340
Pink water sand	5	345
No log	47	392

(A-16-4)34bdb

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Topsoil	5	5
Boulders	5	10
Gravel	15	25
TERTIARY:		
Verde Formation and volcanic rocks (undifferentiated):		
Red sand	75	100
Basalt	20	120
Red sand	10	130
Hard, red and white sandstone	10	140
Hard and soft ledges, limestone	14	154
Red sandstone	37	191
Limestone	4	195
Basalt	2	197
Limestone	1	198
Basalt	84	282
Hard basalt	8	290
Basalt	2	292
Hard basalt	1	293
Red clay; bailed 15 gallons per minute, static water level 25 feet	7	300

(A-16-4)35bcc

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Limestone	160	160
Red quicksand	240	400
Shaley limestone	210	610
Red sandstone	30	640
Gray limestone	180	820
Volcanic rocks:		
Volcanic tuff	14	834
Broken rock	3	837

(A-16-4)35cca2

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Sandy soil	1	1
Lime rock	2	3
Gravel and boulders	32	35
Clay conglomerate	40	75
Sand	5	80
Clay conglomerate	20	100
Sandstone and sand	10	110
Clay conglomerate	20	130
Sand	10	140
Clay conglomerate	35	175
Sand	10	185
Clay	15	200
Clay conglomerate; static water level 100 feet	14	214

(A-16-4)35cdc

	Thickness (feet)	Depth (feet)
TERTIARY:		
Verde Formation:		
Soil	3	3
Lime rock	3	6
Hard clay	24	30
Rock	5	35
Sand and clay	95	130
Quicksand and clay	194	324
Malpais	3	327
Clay	2	329
Limestone	4	333
Clay conglomerate	27	360
Rock	5	365
Clay	21	386
Rock	3	389
Rock; static water level 60 feet	13	402

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
(A-16-5)11acc					
PERMIAN AND PENNSYLVANIAN:			Very hard, no cuttings	12	740
Supai Formation:			Hard sandstone	27	767
No log; water at 488 feet	624	624	Very hard chert and limestone	91	858
Hard to very hard siltstone and sandstone	88	712	MISSISSIPPIAN:		
			Redwall Limestone:		
Medium-hard, white and brown sandstone, some lime and shale	16	728	Fractured Redwall, possible water; static water level 507 feet	10	868
(A-16-6)9cca					
PERMIAN AND PENNSYLVANIAN:					
Supai Formation:					
Red sandstone and some siltstone layers; lots of water washed cuttings away	800	800			
(A-16-6)17cbd					
PERMIAN AND PENNSYLVANIAN:			Soft, broken Supai with cavities	3	127
Supai Formation:			Hard Supai with white veins	189	316
Earth, sand overburden	1	1	Broken and soft spots	75	391
Supai sandstone	39	40	Hard Supai	60	451
Soft Supai, loose	1	41	Very hard Supai	25	476
Supai	23	64	Hard Supai; static water level 414 feet	74	550
Supai	60	124			
(A-16-8)10abc					
TERTIARY:			Black cinders	29	48
Volcanic rocks:			Clay and cinders	7	55
Clay	6	6	Malpais; static water level 7 feet	4	59
Clay and cinders	13	19			
(A-17-1)31b (unsurveyed)					
QUATERNARY:			Broken limestone; lost all water	60	320
Surficial material:			Limestone; hit water at 340 feet	20	340
Topsoil	6	6	Sandstone; water tested 0.5 gallon per minute	20	360
DEVONIAN:			Limestone; good water	55	415
Martin Formation:			PRECAMBRIAN:		
Limestone and boulders	24	30	Red granite; tested well at 428 feet, was unable to lower water level below 345 feet of surface	20	435
Sandstone; little water	90	120			
Limestone, sandstone, shells about 5 feet each	140	260			
(A-17-3)33bda					
QUATERNARY:			Lime clay	25	115
Surficial material:			Limestone	2	117
Boulders	33	33	Lime clay	13	130
TERTIARY:			Limestone	3	133
Verde Formation:			Lime clay	17	150
Brown clay	7	40	Lime conglomerate	40	190
Clay conglomerate	25	65	Limestone	24	214
Clay	8	73	Limestone	3	217
Limestone	4	77	Lime and clay mix; static water level 145 feet	23	240
Clay conglomerate	8	85			
Lime clay	5	90			
(A-17-5)1dbc2					
QUATERNARY:			Brown sandstone, very hard	23	260
Surficial material:			Brown sandstone, medium-hard	17	277
Soil	2	2	Hard, gray sandstone	27	304
PERMIAN AND PENNSYLVANIAN:			Red sandstone, very hard	23	327
Supai Formation:			Badly broken rock, losing drilling water and mud	49	376
Broken sandstone	5	7	Hard, pink sandstone	72	448
Hard, red sandstone with thin layers of shale	101	108	Hard, red layers of sandstone and shale	72	520
Red shale	9	117	Silt, shale, sandstone; broken sandstone, hit water at 575 feet	55	575
Brown sandstone, bad broken spots at 150 feet	56	173	Lime, streaks of shale; static water level 565 feet	65	640
Red sandstone, thin layers of shale	57	230			
Badly broken, losing drilling water and mud	7	237			

(A-17-5)11ccc

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Topsoil	10	10
PERMIAN AND PENNSYLVANIAN:		
Supai Formation:		
Rock, sand, clay	30	40
Sand, rock, clay	11	51
Sandstone and clay	4	55
Rock and clay	37	92
Clay and silt	11	103
Clay and rock	8	111
Sandstone	4	115
Sandstone and clay	55	170
Sandy clay	55	225
Sandstone	7	232
Hard conglomerate	1	233
Sandstone and clay	7	240
Sandstone with hard shells	20	260
Sandstone and clay	55	315
Sandstone, clay, and hard shells	20	335
Sandstone and clay	105	440
Hard sandstone	3	443
Sandstone and clay	7	450
Hard sandstone and clay	50	500
Fractured sandstone	20	520
Sandstone	15	535
Sand and sandstone	15	550
Sandstone	20	570
MISSISSIPPIAN:		
Redwall Limestone:		
Fractured sandstone and limestone	10	580
Sandstone, limestone, and clay	25	605
Sandstone and clay	15	620
Hard sandstone; static water level 531 feet	180	800

(A-17-5)19abd

	Thickness (feet)	Depth (feet)
PERMIAN AND PENNSYLVANIAN:		
Supai Formation:		
Soft, sandy overburden	6	6
Hard Supai sandstone	92	98
Light tan, soft spot	4	102
Hard Supai	86	188
White sandstone	2	190
Supai	12	202
White sandstone	8	210
Tan sandstone	5	215
Sandy, damp spot	15	230
Supai	3	233
Tan sandstone	7	240
White sandstone	2	242
Hard Supai	22	264
White sandstone; damp at 271 feet	7	271
White sandstone	2	273
Red, soft	2	275
Hard Supai	20	295
White sandstone	2	297
Hard Supai	6	303
Tan Supai	25	328
Hard Supai	127	455
Supai, soft	56	511
Chert, extremely hard	4	515
Supai; much more water at 540 feet	46	561
Chert vein	0.5	561.5
Supai	28.5	590
Broken Supai	8	598
MISSISSIPPIAN:		
Redwall Limestone:		
Chert, quartz, and limestone	2	600
Broken limestone(?), lots of white sand at 616 feet; more water flooded out at 605-608 feet	17	617
Cavity	6	623
Broken limestone, sand fills in to 616 feet, cannot drill deeper without casing off; main water vein above point of sand, 605-608 feet. Blowing over 200 gallons per minute from 616 feet	5	628

(A-17-5)26bbb

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Alluvial fill	8	8
PERMIAN AND PENNSYLVANIAN:		
Supai Formation:		
Hard, red sandstone	20	28
Medium-hard, red sandstone; small amount water at 102 feet, water raised to 77 feet	112	140
Red sandstone with a very dark substance in mud	5	145
Red sandstone	14	159
No mud recovery	26	185
Red sandstone; bail test showed fast drawdown to 159 feet, after that about 60 gallons per minute resulted in no drawdown	15	200

(A-17-5)27ccd

	Thickness (feet)	Depth (feet)
PERMIAN AND PENNSYLVANIAN:		
Supai Formation:		
Hard, red sandstone, silty	215	215
Hard, red sandstone	253	468
Very hard siltstone with cracks; water at 470 feet	12	480
Siltstone	15	495
Light-colored siltstone	20	515
Red siltstone	5	520

(A-17-5)27dab1

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Topsoil	12	12
PERMIAN AND PENNSYLVANIAN:		
Supai Formation:		
Soft, red rock	48	60
Hard, red rock; water at 73 feet, 1 gallon per minute	13	73
Soft, red shale	182	255
Hard sandstone; crack at 280 feet lost water	105	360
Very hard rock	10	370
Soft sandstone	25	395
Soft, red sandstone; bail tested 8 gallons per minute with sand	7	402

(A-17-5)29bab

	Thickness (feet)	Depth (feet)
PERMIAN AND PENNSYLVANIAN:		
Supai Formation:		
Red sandstone and siltstone layers	620	620

(A-17-5)29bbd

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Hard, red sandstone with thin layers of shale	121	324
Surficial material:			Bad cracks; losing drilling water	44	368
Soil	3	3	Very hard, pink sandstone	44	412
PERMIAN AND PENNSYLVANIAN:			Broken, red sandstone; losing water	11	423
Supai Formation:			Solid, red sandstone; hit water at 455 feet, hit water in seams in rock with large stream of water at 477 feet, washed away all cuttings	62	485
Brown shale	11	14	Very broken; water, bailed 218 gallons per minute in 30 minutes with no drawdown	10	495
Brown and red sandstone	45	59			
Layers of shale and pink sandstone	37	96			
Badly fractured cracks; losing drilling water	15	111			
Very hard, red sandstone	35	146			
Red shale and sandstone	38	184			
Badly broken shale and red sandstone	19	203			

(A-17-5)33ada1

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Fractured, red sandstone, required blasting; more water	30	295
Surficial material:			Red sandstone with thin layers of clay	227	522
Sand, gravel, and boulders	19	19	MISSISSIPPIAN:		
PERMIAN AND PENNSYLVANIAN:			Redwall Limestone:		
Supai Formation:			Hard limestone with silicified lime ledges	48	570
Red sandstone, medium-hard	16	35	Porous limestone, bailed, no cuttings	30	600
Red sandstone with layers of clay	35	70	Redwall limestone, cuttings white	32	632
Fractured sandstone, blasted	30	100	Breccia limestone with brown shale seams; cut oversize hole	68	700
Red sandstone, hard	85	185			
Red sandstone, hard with lime ledges; water at 220 feet	80	265			

(A-17-5)36cdb

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Medium-hard, red sandstone	35	530
Surficial material:			Very hard, red sandstone	50	580
Topsoil	2	2	Medium-hard, red sandstone	10	590
PERMIAN AND PENNSYLVANIAN:			Soft, red, sandy shale	6	596
Supai Formation:			Soft, red sandstone	44	640
Very hard, red sandstone	10	12	MISSISSIPPIAN:		
Medium-hard, red sandstone	50	62	Redwall Limestone:		
Hard, red, sandy shale	12	74	White limestone; second water at 620-729 feet, highly fractured and channeled limestone, water movement carried away portions of cuttings, static water level 437 feet	89	729
Medium-hard, red sandstone	86	160			
Very hard, red sandstone	75	235			
Hard, red sandstone	50	285			
Medium-hard, red, sandy shale	25	310			
Extra-hard, red sandstone; first water at 470-478 feet	185	495			

(A-17-6)8baa

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			Pale pink, white, tan limestone, highly fossiliferous, some loosely sorted and recovered whole, average 30 percent, cavity filling with dark-red claystone; major water entry intermittently, static water level 67 feet	70	288
Surficial material:			Same, except very few fossils; good water entry 297-328 feet	40	328
River-run alluvium, sand, gravel, small to large malpais boulders (up to 3 feet in diameter); surface water at 12 feet, static water level 12 feet	28	28	DEVONIAN:		
PERMIAN AND PENNSYLVANIAN:			Martin Formation:		
Supai Formation:			Purple-mottled dolomite with some sand, formation transition zone; static water level 66 feet	7	335
Red sandstone, dark-red shale, mudstone, and chert stringers, some pink limestone	85	113			
Red sandstone, shale, chert, mudstone, and some limestone, light-pink to dark-red	12	125			
MISSISSIPPIAN:					
Redwall Limestone:					
White, pink limestone with some intermittent dark-red mudstone cavity filling, cherty in part, mostly hard with some fracturing; water entry commencing at 145 feet, static water level 72 feet	93	218			

(A-17-6)8bdb

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
QUATERNARY:			PERMIAN AND PENNSYLVANIAN:		
Surficial material:			Supai Formation:		
Alluvium, malpais, boulders, and coarse sand	53	53	Supai or fault gouge, sticky reddish-brown clay and friable to loose-running sand	162	215

(A-18-2)25bcb

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Boulders and sand	26	26
PERMIAN AND PENNSYLVANIAN:		
Supai Formation:		
Dark sandstone with layers of sand broken on a slant	86	112
Dark-brown sandstone with thin layers of shale	25	137
Light-brown sandstone, broken and hard	12	149
Dark-brown sandstone	69	218
Hard, brown shale with streaks of sandstone	44	262
Light-brown sandstone with sand pockets	7	269
Bad cracks in hard, dark-brown sandstone	39	308
Red shale with thin layers of sandstone	48	356
Bad slant in shale and sandstone, brown in color	24	380
Brown shale with hard layers of sandstone	88	468
Red shale and sandstone, softer	23	491
Hard, red sandstone	13	504
Light-brown shale	9	513
Hard, brown sandstone	26	539
Large cavities with layers of sandstone	9	548
Brown sandstone	27	575
Very hard, brown sandstone	17	592
Brown shale, soft	22	614
White and pink lime	5	619
Loose, red sand	12	631
Hard, light-gray sandstone, some pink; hit first water at 638 feet	95	726

(A-18-2)31dcc

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Gravel:		
Clay	40	40
Sand, gravel, and boulders	10	50
TERTIARY:		
Sedimentary rocks:		
Conglomerate	20	70
Caliche clay	60	130
Sand and gravel; some water from gravel strata at 130 feet	10	140
Conglomerate	30	170
Volcanic rocks:		
Black malpais; some water	90	260
PERMIAN AND PENNSYLVANIAN:		
Supai Formation:		
Soft sandstone; most water	20	280
Hard, red limestone	5	285

(A-18-6)34bba

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Topsoil, clay, rock fragments	2	2
Boulders, river-run with sand; water	25	27
PERMIAN AND PENNSYLVANIAN:		
Supai Formation:		
Red shales and sandstone; small stream of water at 52 feet, 1-2 gallons per minute, large stream of water at 158 feet from shale bed, static water level 155 feet	149	176

(A-18-7)8ddc

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Surface soil and malpais boulders	14	14
TERTIARY:		
Volcanic rocks and sedimentary rocks (undifferentiated):		
Malpais	12	26
Loose malpais	11	37
Red malpais	321	358
Blue-gray malpais	196	554
Brown sandstone	27	581
Red sandstone; hit some water at 640 feet	69	650
Hard, dark-brown malpais	12	662
Gray malpais	23	685
Dark-gray malpais	20	705
Brown malpais	6	711
Red malpais, hard last 2 feet	26	737
Bluish-gray malpais	11	748
Dark-red cinders; hit good flow of water at 750 feet, made bailer test 29.47 gallons per minute	12	760
PERMIAN:		
Toroweap(?) Formation:		
Red, badly caving sand	20	780
Brown sand	145	925
Coconino Sandstone:		
Yellow sand	10	935
Brownish-red sand, hard	19	954
Yellow sand, coarse	76	1,030
Yellow sandstone; possible water	5	1,035
Yellow sandstone; possible water at 1,240 feet	211	1,246
Yellow sandstone; possible water at 1,340 feet	254	1,500

(A-18-7)15ccc2

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Alluvium:		
Heavy clay with small amount of cinders	105	105
Cinder content increased	15	120
Good cinders with little clay, heavy clay layer at 200-210 feet	160	280
TERTIARY:		
Volcanic rocks:		
Malpais; static water level 149.5 feet, yield 50 gallons per minute, draw-down 6.2 feet, 2 hours pumping	8	288
No log	422	710
Cinders	8	718
Malpais	52	770
Cinders	16	786
Malpais	404	1,190
PERMIAN:		
Coconino Sandstone:		
Sandstone; water 1,200-1,205 feet, reported to yield 100 gallons per minute, water level 705 feet	62	1,252

(A-18-7)22abc

	Thickness (feet)	Depth (feet)
QUATERNARY:		
Surficial material:		
Topsoil	6	6
Heavy clay	4	10
Clay, rock, and gravel	10	20
TERTIARY:		
Volcanic rocks:		
Clay, cinders, and fine gravel	40	60
Clay and cinders, very few cinders	140	200
Clay and few more cinders than above	60	260
Cinders with little clay	35	295
Heavy clay	5	300
Cinders and clay	10	310
Fractured malpais	2	312

	Thick-ness (feet)	Depth (feet)		Thick-ness (feet)	Depth (feet)
(A-18-7)27cba					
TERTIARY:					
Volcanic rocks:					
Volcanics, lava, and cinders; yield fluctuates seasonally	400	400			
(A-18-7)27cbb					
TERTIARY:			Red, yellow sand and siltstone	562	1,195
Volcanic rocks:			PERMIAN AND PENNSYLVANIAN:		
Malpais	380	380	Supai Formation:		
Lime	3	383	Sandstone; water at 1,410 feet, static water level 1,279 feet	305	1,500
Malpais	237	620			
PERMIAN:					
Coconino Sandstone:					
Caving, red sand	13	633			
(A-18-9)28cad					
QUATERNARY:			Very hard basalt	13	113
Surficial material:			Red shale and sand; water 5 gallons per minute	7	120
Soil and boulders	3	3			
TERTIARY:					
Volcanic rocks:					
Hard, broken basalt, clay in cracks	97	100			
(A-18-9)29ddb					
QUATERNARY:			Clay, cinders, malpais drift, mixed clay, and gravel	24	43.5
Alluvium:			Basalt; static water level 11 feet	1	44.5
Clay	11	11			
TERTIARY:					
Volcanic rocks:					
Cinders, gravel, malpais drift	8.5	19.5			
(A-19-6)27abb					
PERMIAN AND PENNSYLVANIAN:			Very hard Supai	7	220
Supai Formation:			Medium Supai; first big water at 218 feet	93	313
Soft Supai overburden	18	18	Hard Supai	25	338
Hard Supai	32	50	Chert; static water level 9 feet	4	342
Medium-hard Supai	100	150			
Medium Supai; first water at 183 feet, seep	63	213			
(A-19-7)20cba					
TERTIARY:			Malpais; water standing in bottom of hole	365	485
Volcanic rocks:					
Cinders and clay	120	120			
(A-20-7)20cca					
PERMIAN:			Coconino Sandstone, yellow	35	475
Kaibab Limestone:			Coconino Sandstone, pink	25	500
Kaibab Limestone, yellow	200	200	Coconino Sandstone, yellow	30	530
Kaibab Limestone, pink	50	250	Coconino Sandstone, brown	475	1,005
Toroweap Formation:			PERMIAN AND PENNSYLVANIAN:		
Toroweap limestone, white	160	410	Supai Formation:		
Coconino Sandstone:			Supai(?), yellow	100	1,105
Coconino Sandstone, brown	30	440	Supai, red; static water level 662 feet	105	1,210
(A-20-8)18bcc					
PERMIAN:			Coconino Sandstone:		
Kaibab Limestone:			Reddish-brown, fine- to medium-grained sandstone	110	460
Tan, sandy limestone	40	40	Yellowish-brown, fine-grained sandstone	180	640
Pink, sandy limestone	70	110	Buff, fine-grained sandstone	150	790
Pink, limey sandstone	40	150	Light-tan, very fine grained sandstone	298	1,088
Pink to tan, sandy limestone	200	350			
(A-20-8)20dbc					
QUATERNARY:			Coconino Sandstone, yellow and brown	20	935
Alluvium:			Coconino Sandstone, yellow	170	1,105
Topsoil, black, soft	10	10	Coconino Sandstone, brown	40	1,145
PERMIAN:			Coconino Sandstone, red, medium	100	1,245
Kaibab Limestone:			PERMIAN AND PENNSYLVANIAN:		
Kaibab limestone, gray, medium	250	260	Supai Formation:		
Coconino Sandstone:			In this area formation changes to Supai, red	47	1,292
Coconino Sandstone	440	700	Supai, red; static water level 279 feet 4 inches	44	1,336
Coconino Sandstone, yellow and brown	55	755			
Coconino Sandstone, yellow	160	915			

	Thick-ness (feet)	Depth (feet)		Thick-ness (feet)	Depth (feet)
(A-21-3)6aba					
QUATERNARY:			Sandstone, white, tan, and pink	91	368
Surficial material:			Limestone, white	52	420
Boulders, clay fill	6	6	Sandstone and limestone, white	56	476
TERTIARY:			Sandstone with white, pink quartz		
Volcanic rocks:			and limestone	26	502
Malpais, gray and black	229	235	Base material, yellow with flint,		
Brown rock, very hard	14	249	agate, quartz	20	522
Red cinders	4	253	Very hard flint, agate, or quartz	6	528
Black cinders	6	259	Toroweap(?) Formation or Coconino(?)		
Malpais, gray	6	265	Sandstone:		
PERMIAN:			Tan sandstone,		
Kaibab Limestone:			fine-grained	25	553
Red shale or sandstone	12	277	No log	197	750
(A-21-4)33ddd					
TERTIARY:					
Volcanic rocks:					
Malpais, boulders, and silt	14	14	Solid malpais; most water at 35 feet	27	41

ARIZONA DEPARTMENT
OF WATER RESOURCES
BULLETIN 3

)ROLOGY OF A STREAM-AQUIFER SYSTEM IN THE
ЛP VERDE AREA, YAVAPAI COUNTY, ARIZONA

BY SANDRA J. OWEN-JOYCE

PREPARED BY THE GEOLOGICAL SURVEY · UNITED STATES DEPARTMENT OF THE INTERIOR

ARIZONA DEPARTMENT OF WATER RESOURCES BULLETINS

The following reports are available for distribution at the Arizona Department of Water Resources, 99 East Virginia, Phoenix, and at U.S. Geological Survey offices in: Federal Building, 301 West Congress Street, Tucson, and 3738 North 16th Street, Suite E, Phoenix.

No.

1. Geohydrology and water use in southern Apache County, Arizona, by L. J. Mann and E. A. Nemecek: 86 p., 5 pls., 3 figs., 1983.

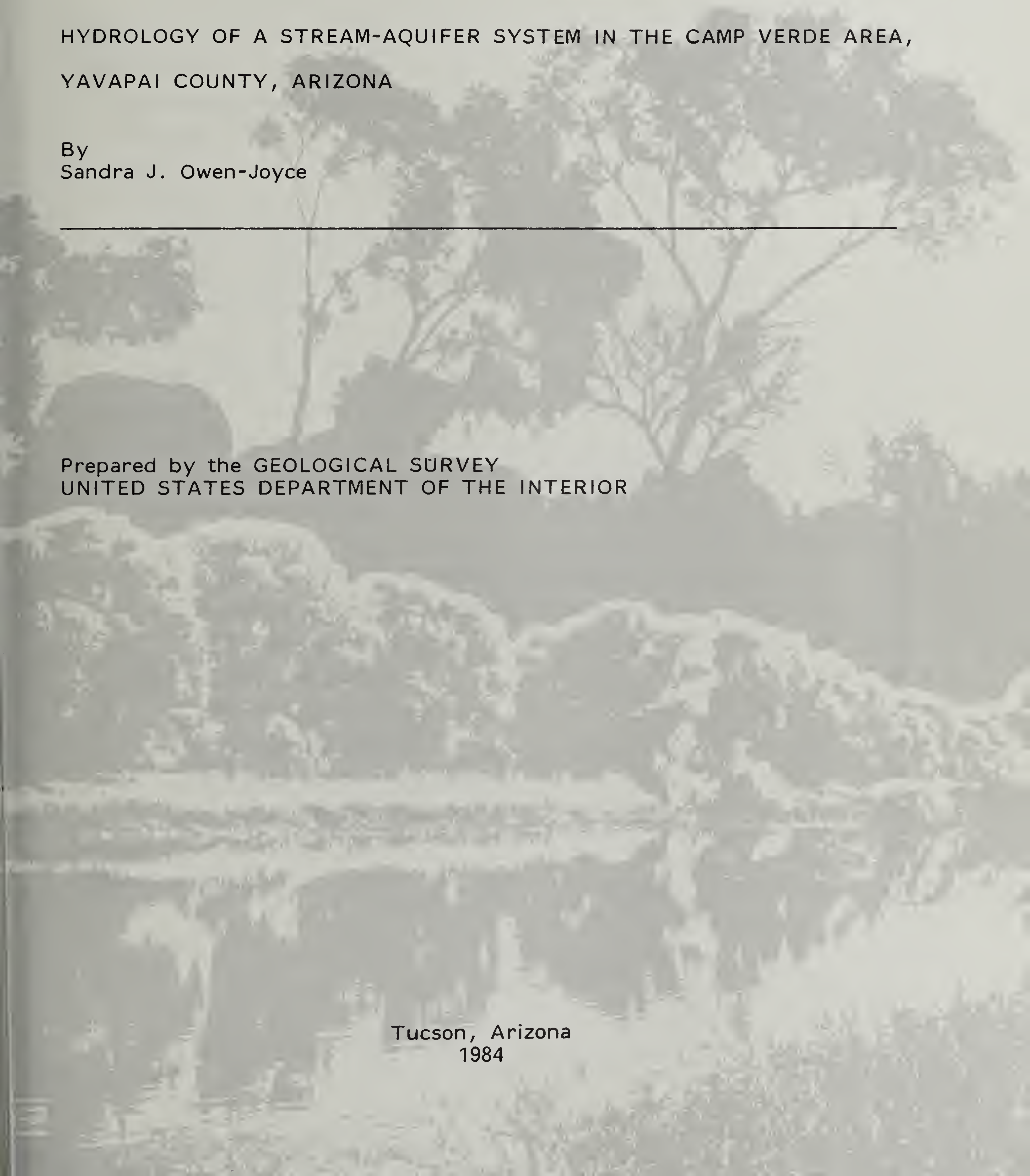
2. Appraisal of water resources in the upper Verde River area, Yavapai and Coconino Counties, Arizona, by S. J. Owen-Joyce and C. K. Bell: 219 p., 3 pls., 11 figs., 1983.

3. Hydrology of a stream-aquifer system in the Camp Verde area, Yavapai County, Arizona, by S. J. Owen-Joyce: 60 p., 3 pls., 14 figs., 1984.

ARIZONA DEPARTMENT OF WATER RESOURCES
BULLETIN 3

HYDROLOGY OF A STREAM-AQUIFER SYSTEM IN THE CAMP VERDE AREA, YAVAPAI COUNTY, ARIZONA

By
Sandra J. Owen-Joyce



Prepared by the GEOLOGICAL SURVEY
UNITED STATES DEPARTMENT OF THE INTERIOR

Tucson, Arizona
1984

CONTENTS

ILLUSTRATIONS

[Plates are in pocket]

TABLES

For readers who prefer to use metric units, the conversion factors for the terms used in this report are listed below:

Multiply	By	To obtain
inch (in.)	25.4	millimeter (mm)
inch per hour (in./hr)	25.4	millimeter per hour (mm/hr)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
acre	4,047	square meter (m^2)
square mile (mi^2)	2.590	square kilometer (km^2)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
acre-foot (acre-ft)	1,233	cubic meter (m^3)
acre-foot per acre (acre-ft/acre)	0.3047	cubic meter per square meter (m^3/m^2)
gallon per minute (gal/min)	0.06309	liter per second (L/s)
gallon per day (gal/d)	0.003785	cubic meter per day (m^3/d)
degree Fahrenheit (°F)	(temp °F-32)/1.8	degree Celsius (°C)

National Geodetic Vertical Datum of 1929 (NGVD of 1929): A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "Mean Sea Level."

HYDROLOGY OF A STREAM-AQUIFER SYSTEM IN THE CAMP VERDE AREA, YAVAPAI COUNTY, ARIZONA

By

Sandra J. Owen-Joyce

ABSTRACT

A dynamic interaction between the distribution of 30,000 acre-feet of water diverted from the Verde River to irrigate fields on the alluvium and the inflow of about 1,000 acre-feet of water from the underlying artesian aquifer in the Verde Formation determines the quantity and quality of water in the alluvium south of Camp Verde, Arizona. About 70 percent or 21,800 acre-feet of the diverted irrigation water returns to the Verde River as subsurface flow, which with 14,000 acre-feet of water flowing through the alluvium from West Clear Creek to the Verde River flushes the alluvial aquifer. About 9,300 acre-feet of water is lost to evapotranspiration. Inflow from the Verde Formation locally increases the concentration of dissolved solids, sulfate, chloride, and arsenic in the alluvium. Water quality in the alluvium would deteriorate without the dilution effect caused by the deep percolation of irrigation water applied on the alluvium and ground water in the alluvium along the Verde River is an important source of domestic water.

Ground water in the alluvium is unconfined and hydraulically connected to the Verde River and Verde Formation. Ground-water inflow to the alluvium from the Verde Formation occurs in areas where the hydraulic head in the Verde Formation is higher than the hydraulic head in the alluvium; wells open to both formations are another path of ground-water inflow. Near the southern extent of the alluvium, the hydraulic head in the Verde Formation is lower than the hydraulic head in the alluvium and some water flows from the alluvium into the underlying Verde Formation. In 1981 water levels in wells ranged from about 5 to 50 feet below the land surface and fluctuated as much as 5 feet owing to deep percolation of irrigation water. Saturated thickness in the alluvium ranged from 0 to about 30 feet in February to April 1981; the annual minimum amount of water stored in the alluvium occurs prior to irrigation and was estimated to be 17,500 acre-feet.

Ground water from most of the alluvium contained more than the maximum contaminant level for dissolved solids and in some areas contained more than the maximum contaminant levels for sulfate, chloride, and arsenic in public water supplies proposed by the U.S. Environmental Protection Agency and the State of Arizona. Dissolved-solids concentrations ranged from 251 to 4,400 milligrams per liter; 85 percent of the samples exceeded 500 milligrams per liter. Locally, the presence of

reworked Verde Formation deposited in the alluvium causes large concentrations of dissolved solids and sulfate particularly downslope from the salt mine in sec. 1, T. 13 N., R. 4 E. Ammonia concentrations ranged from 0.01 to 0.25 milligram per liter; more than 0.1 milligram per liter generally indicates organic pollution.

INTRODUCTION

Increases in population and concentration of development along the Verde River flood plain are occurring in the Verde Valley in central Arizona, which is changing the way that land is used along the river. Some areas previously used for agriculture are being subdivided and the amount of ground water used for a domestic and public water supplies is increasing. Some of the residents continue to irrigate with river water. In other areas of the flood plain, land previously covered by natural vegetation has been cultivated.

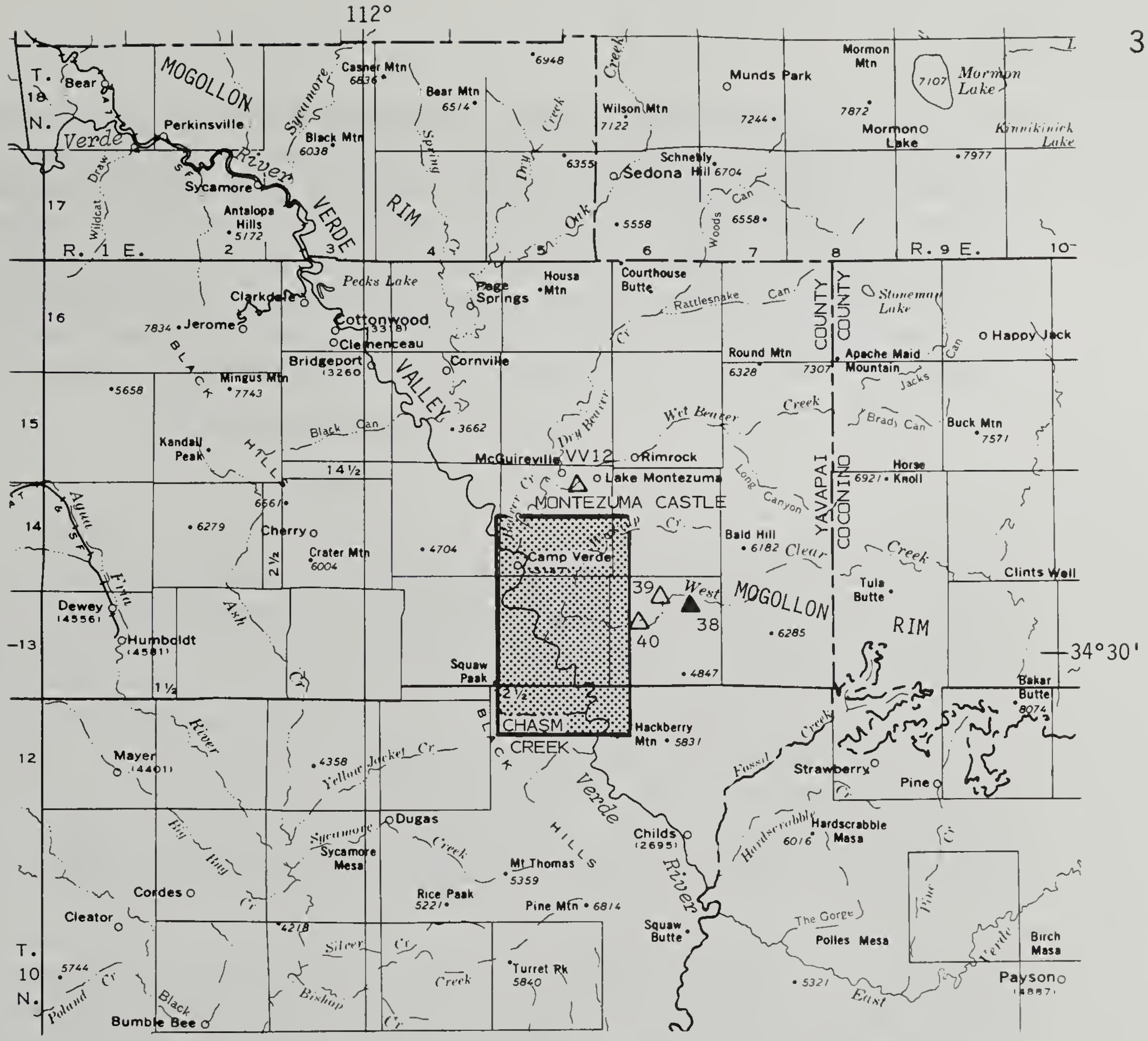
The Verde Valley has been identified as the area with the highest water-quality planning priority in northern Arizona (Northern Arizona Council of Governments, 1979). Residents and managers are interested in identifying and eliminating possible sources of pollution to the waters of the valley. Part of the Verde Valley south of Camp Verde along the flood plain of the Verde River was chosen for intensive study. This area has experienced a population increase in the past 10 years and the population is still growing. This study was made in order to understand the hydrologic system in the alluvium and the role that water quality plays in the system and was made by the U.S. Geological Survey in cooperation with the Arizona Department of Water Resources.

Location of the Area

The Camp Verde area is in the southeastern part of the Verde Valley and occupies about 80 mi^2 (fig. 1). The Camp Verde area is bounded by the Black Hills to the southwest; the northeast boundary is near the base of the Mogollon Rim escarpment. Altitudes in the Black Hills range from 4,000 to 6,500 ft above the National Geodetic Vertical Datum of 1929. The base of the Mogollon Rim escarpment lies just outside the area boundary at an altitude of about 4,000 ft. On the upper edge of the Mogollon Rim, altitudes range from 5,500 to 6,000 ft. The Verde River flows southeastward through the area from an altitude of 3,070 ft at Beaver Creek to 2,880 ft at Chasm Creek.

Purpose

Ground water in the alluvium along the Verde River was studied to provide information for planning and managing the use of water



BASE FROM U.S. GEOLOGICAL SURVEY
STATE BASE MAP, 1:500,000, 1974

0 10 20 30 MILES
0 10 20 30 KILOMETERS

INDEX MAP SHOWING AREA
OF REPORT (SHADED)

EXPLANATION

▲38 STREAMFLOW-GAGING STATION—Operated by the U.S. Geological Survey. Number, 38, corresponds to that in table 1

△40 MISCELLANEOUS STREAMFLOW-MEASUREMENT SITE—Number, 40, corresponds to that in table 1

Figure 1.--Area of report.

resources in the area. The purpose of the investigation was to describe the hydrologic system in the Camp Verde area and the quantity and chemical quality of the ground water in the alluvium adjacent to a selected reach of the river south of Camp Verde. This report summarizes the results of a 2-year investigation of the primary factors that control the distribution, volume, and quality of water in the alluvium. The findings of the study will aid in planning ground-water development along the Verde River and in monitoring water quality in the alluvium and river.

Scope

This report describes the hydrologic system in the Camp Verde area and emphasizes the interaction of the Verde River, alluvium, and Verde Formation. Base-flow information for the Verde River pertinent to this study is summarized from a detailed study by Owen-Joyce and Bell (1983) and supplemented with additional seepage investigations and low-flow discharge data for the period of this study. The report describes the distribution and lithology of the alluvium and the Verde Formation, ground-water recharge and storage, changes in water levels, and chemical quality of water in the alluvium along the Verde River. Ground water in the Verde Formation is described as it interacts with ground water in the alluvium. The chemical quality of ground water was used as a tool to develop an understanding of how the hydrologic system functions and to evaluate the suitability of the water for domestic use. An annual water budget for the alluvium described in hydrologic-cycle order was prepared to show estimates of the amounts and components of inflow to and outflow from the alluvium. The quality of water and its relation to specific components of the water budget is discussed in the sections dealing with those components. Most of the water-quality sampling was done from February to April to approximate conditions in the alluvium before the start of dilution from irrigation.

Climate

The semiarid climate is a major factor in attracting people to the Verde Valley. Mean daily temperatures at Montezuma Castle National Monument (fig. 1) range from 42° to 80°F; temperature extremes of -1°F and 117°F have been recorded (Sellers and Hill, 1974, p. 332). The daily temperature variation generally exceeds 40°F during the summer. Annual precipitation at Montezuma Castle National Monument ranges from 3.5 to 22 in.; mean annual precipitation is 12 in. South of the valley toward Childs and east to the Mogollon Rim, the mean annual precipitation ranges from 17 to 19 in. Mean annual precipitation at Jerome in the Black Hills is 18 in. Mean annual snowfall at Montezuma Castle is about 3 in., whereas the mean annual snowfall in Jerome is 25 in.

Precipitation in the area is seasonal. At Montezuma Castle National Monument, about 50 percent of the precipitation occurs from

October through April as winter storms spread rainfall of light to moderate intensity across large parts of the southwestern United States. Precipitation often occurs as rain at lower altitudes and as snow at higher altitudes. The driest months are May and June. About 40 percent of the precipitation occurs in July, August, and September when short-duration locally intense thunderstorms are common.

Methods of Investigation

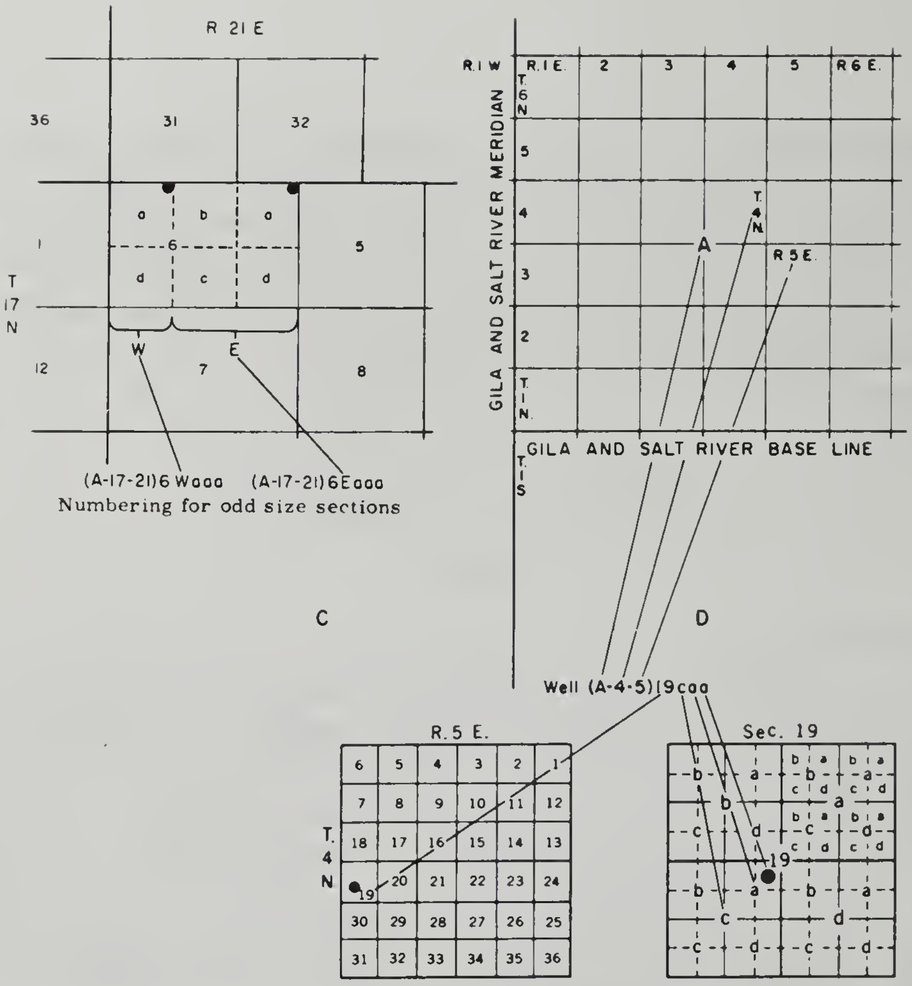
The fieldwork for this report was done from November 1980 to March 1982. An inventory was made of wells and springs; water levels were measured in wells where possible and 17 wells were measured periodically from 1981 to 1982. Well and spring locations are described in accordance with the well-numbering system used in Arizona, which is explained and illustrated in figure 2. The altitudes of wells and springs were obtained from U.S. Geological Survey topographic maps at a scale of 1:24,000 with contour intervals of 20 and 40 ft and topographic maps compiled for the Verde River Flood Study at a scale of 1:2,400 with a contour interval of 5 ft (Henningson, Durham, and Richardson, consulting engineers, Phoenix, written commun., 1982).

Two seepage investigations were made along the Verde River from 0.25 mi upstream from the mouth of Beaver Creek to the Verde River near Camp Verde gaging station. Discharge measurements were made at 18 sites on the Verde River and 40 sites on tributary streams, springs, and irrigation diversions and returns.

Water samples were collected from the Verde River, and selected wells, springs, and tributaries. Water samples from most wells were analyzed for arsenic, nitrate, nitrite, ammonia, and orthophosphate, and some of these water samples were analyzed for common ions and selected trace elements. Water samples from the Verde River, springs, and selected tributaries collected during the seepage investigations were analyzed for common ions, nutrients, and arsenic. Return flows from the irrigation ditches were analyzed for nutrients—nitrate, nitrite, ammonia, and orthophosphate.

The generalized geologic map was compiled from published and unpublished maps, aerial photographs, and fieldmapping. Lithologic and drillers' logs of wells were examined to determine the thickness, physical characteristics, and water-yielding potential of the alluvium.

The hydrologic data collected and used in this report are available, for the most part, in computer-printout form and may be consulted at the Arizona Department of Water Resources, 99 East Virginia, Phoenix, and U.S. Geological Survey offices in: Federal Building, 301 West Congress Street, Tucson, and 2255 North Gemini Drive, Flagstaff.



The well numbers and letters used by the Geological Survey in Arizona are in accordance with the Bureau of Land Management's system of land subdivision. The land survey in Arizona is based on the Gila and Salt River meridian and base line, which divide the State into four quadrants. These quadrants are designated counterclockwise by the capital letters A, B, C, and D. All land north and east of the point of origin is in A quadrant, that north and west is in B quadrant, that south and west in C quadrant, and that south and east in D quadrant. The first digit of a well number indicates the township, the second the range, and the third the section in which the well is situated. The lowercase letters a, b, c, and d after the section number indicate the well location within the section. The first letter denotes a particular 160-acre tract, the second the 40-acre tract, and the third the 10-acre tract. These letters are also assigned in a counterclockwise direction, beginning in the northeast quarter. If the location is known within the 10-acre tract, three lowercase letters are shown in the well number. In the example shown in figure 2, well number (A-4-5)19caa designates the well as being in the NE¼NE¼SW¼ sec. 19, T. 4 N., R. 5 E. Where there is more than one well within a 10-acre tract, consecutive numbers beginning with 1 are added as suffixes.

When a section is more than 1 mile in any dimension, the section number applies as usual. The oversized section is divided so that a full square-mile unit of the section is adjacent to a normal section within the same township; the remainder is considered as a separate unit of land. Appropriate N., S., E., or W. letters are assigned to the units, depending upon where they lie in relation to the full square-mile unit. A well would be designated as shown in figure 2 with the appropriate letter following the section number in which the well is located.

Figure 2.--Well-numbering system in Arizona.

Previous Investigations

Ground-water resources and geology of the Verde Valley were studied by Twenter and Metzger (1963). Ground water, base flow, and water quality were investigated in a water-resources study in the upper Verde River area (Owen-Joyce and Bell, 1983). Basic data have been compiled as maps showing ground-water conditions in the upper Verde River area (Levings and Mann, 1980). The chemical character of ground water was used to indicate potential geothermal resource areas in the Verde Valley (Ross and Farrar, 1980). Evapotranspiration losses were estimated in a study of flood-plain areas in central Arizona (Anderson, 1976).

Water quality is an important issue that was investigated in the Verde Valley (Northern Arizona Council of Governments, 1979; Milne, 1981). These studies resulted in a water-quality management plan for the Verde Valley (Towler, 1982).

Several geologic studies have been made of the Verde Formation. An early study identified the minerals in the deposits of sulphate of soda (Blake, 1890). Studies on the history of the basin and lake deposits followed (Jenkins, 1923; Wadell, 1972; Nations, 1974; Nations and others, 1981). Geologic mapping and mineral-resources studies are in preparation for Arnold Mesa (E. W. Wolfe, U.S. Geological Survey, written commun., 1981) and have been prepared for West Clear Creek (Ulrich and Bielski, 1983).

Acknowledgments

The author gratefully acknowledges the cooperation of the many residents of the area who granted permission to work on their property and supplied information about their wells and the water companies and Arizona Department of Water Resources who furnished information for the study. Special appreciation is extended to the well drillers and residents for invaluable help in supplying historical information and data. Special thanks are due to Mr. E. E. Smith of Henningson, Durham, and Richardson, consulting engineers, for copies of current topographic maps of the area north of West Clear Creek along the Verde River flood plain, and to Mr. J. E. Alam of the U.S. Soil Conservation Service for information on the irrigation system and practices used in the Verde Valley.

HYDROLOGY

The flood plain of the Verde River is underlain by alluvium of Quaternary age that is hydraulically connected to the river. The alluvium is underlain by the Verde Formation of Tertiary age. Ground

water in the alluvium and the Verde Formation is used principally for domestic and public water supplies. Water from the alluvium generally is of better quality than water from the Verde Formation; therefore, the alluvium is an important source of domestic drinking water.

Surface water from the Verde River is used for irrigation, livestock watering, and recreation. Water from the Verde River is transferred to the fields in irrigation ditches located on both sides of the river. Direct evidence of springs and measurements of streamflow along the Verde River south of Camp Verde to the Verde River near Camp Verde gaging station indicate that this is a gaining reach of the river. Water-quality problems that involve large concentrations of dissolved solids, sulfate, fluoride, and arsenic have been identified in this area of the Verde Valley (Owen-Joyce and Bell, 1983).

An evaluation of the water resources of the alluvium along the Verde River requires a knowledge of the factors that affect the hydrologic system—precipitation, streamflow, irrigation, subsurface flow, inflow to and outflow from an underlying artesian system, pumpage, and water loss by evaporation and transpiration—and how these factors interrelate. Of these factors, irrigation has the greatest effect on the amount and movement of water in the study area. The primary source of irrigation water is the Verde River; since the late 1800's, water has been diverted and transported in irrigation ditches to fields located on the alluvium (fig. 3). Part of the irrigation water is transpired by crops but most infiltrates to the water table. Some water is transpired by riparian vegetation. Water levels in wells respond almost immediately to irrigation. A mounding of the water table under the fields occurs during the irrigation season steepening the water-table gradient and increasing the flow downgradient (fig. 4) to the Verde River where ground water is discharged (fig. 3). Subsurface flow originating from tributary drainage basins moves through the alluvium to discharge to the river. In several places, ground water flows from the Verde Formation into the alluvium (fig. 4); in another place, ground water flows from the alluvium into the Verde Formation (fig. 5).

About 10 years ago, the farmlands began to be subdivided and pumping of ground water from the alluvium and Verde Formation for domestic use increased as the population increased. As the drilling of wells progressed, it became evident that water obtained from the alluvium was of better quality than water obtained from the Verde Formation. Almost all the water pumped is returned to the alluvium through sewage disposal. Some residences and businesses in Camp Verde are connected to a community septic system; other residences in town and those south of town have septic tanks.

Gravel deposits of Quaternary age are widespread in the study area (pl. 1), unconformably overlie the Verde Formation and volcanic rocks, and are as much as 120 ft thick (Ulrich and Bielski, 1983). Composition is dependent on source area. The gravels are permeable and allow water to infiltrate into underlying units but do not yield water to wells because they lie above the water table.

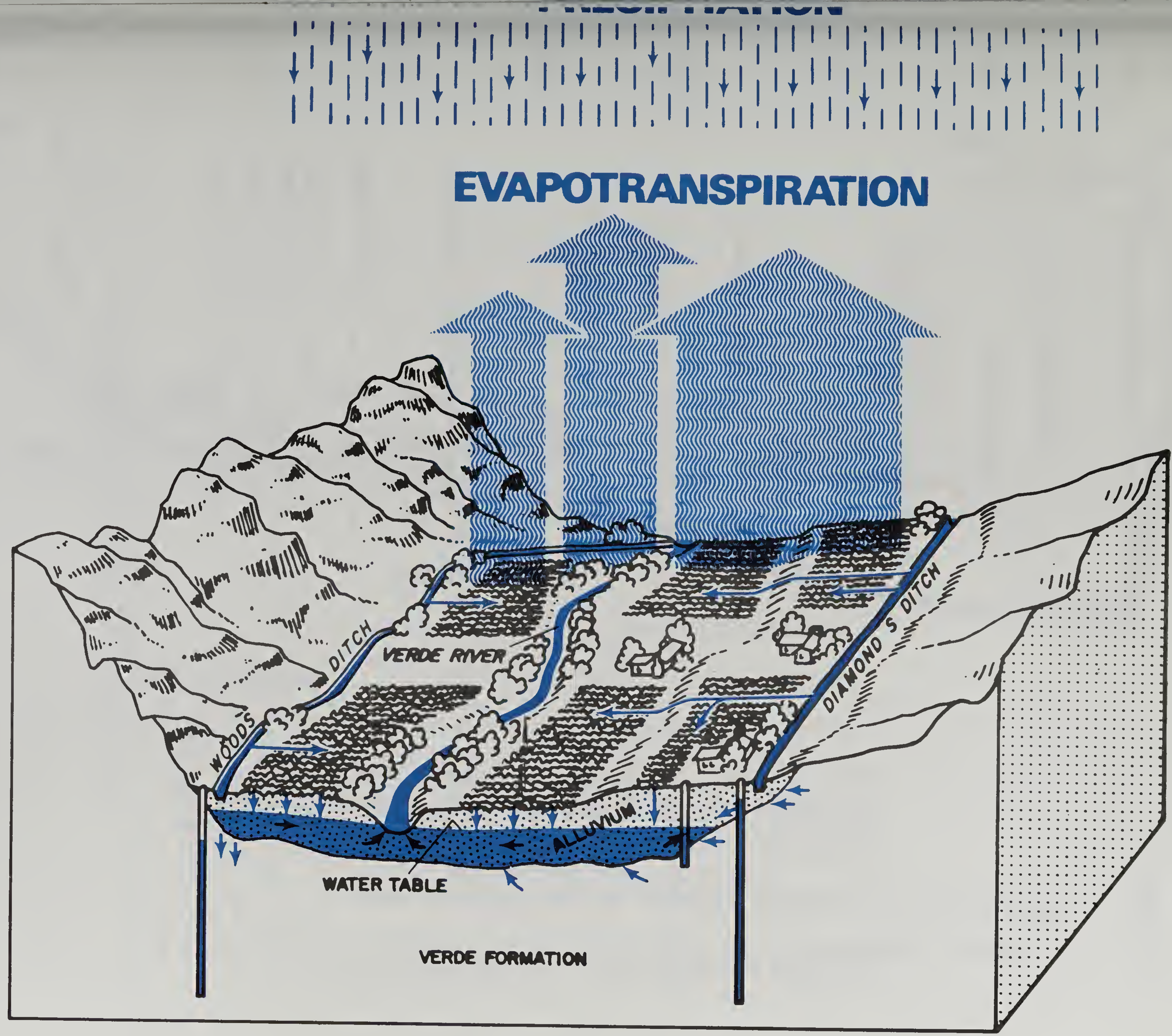


Figure 3.--Generalized block diagram illustrating the hydrologic system.

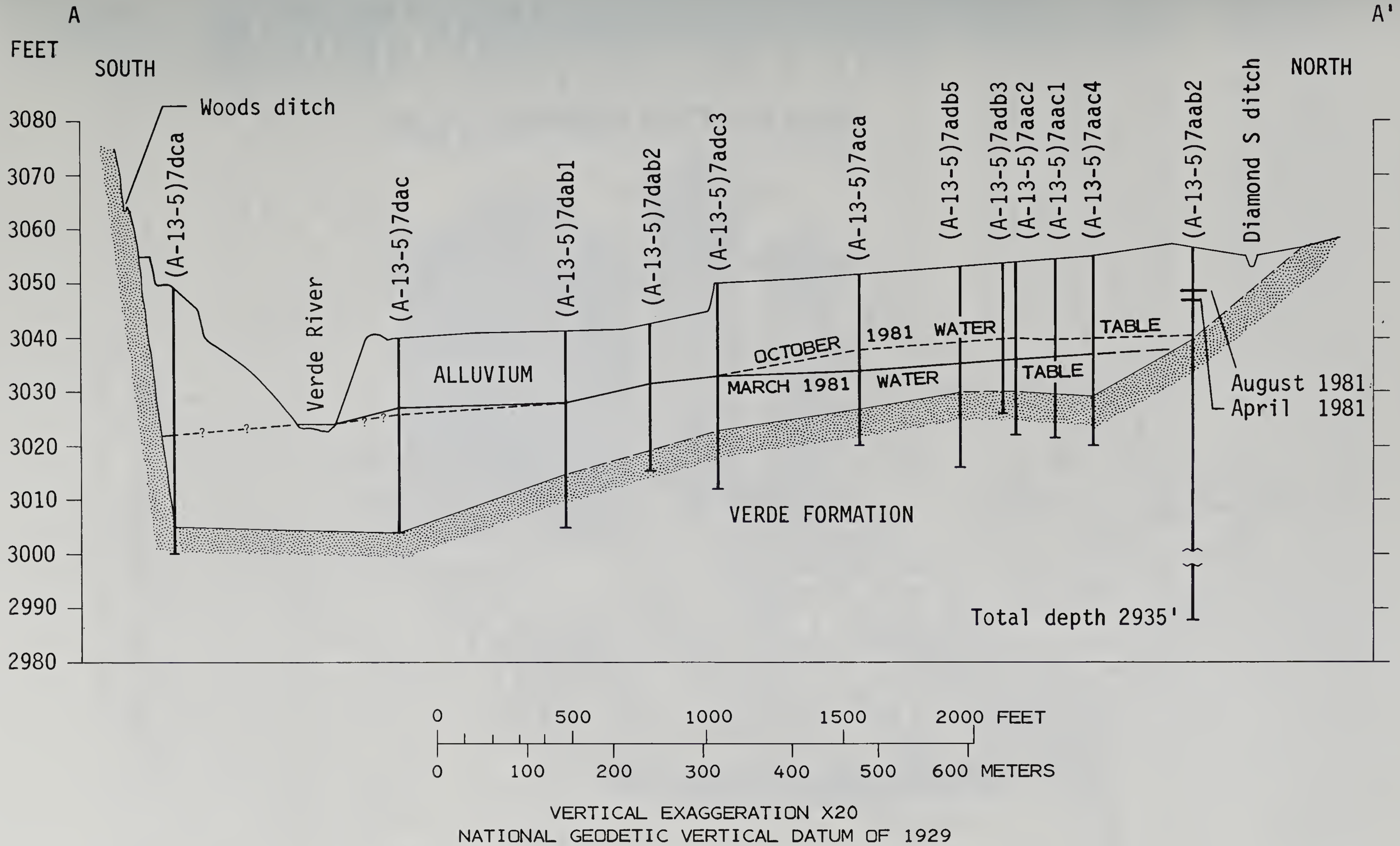


Figure 4.--Geohydrologic section A-A' in secs. 6 and 7, T. 13 N., R. 5 E. (Location of section A-A' is shown on plate 1.)

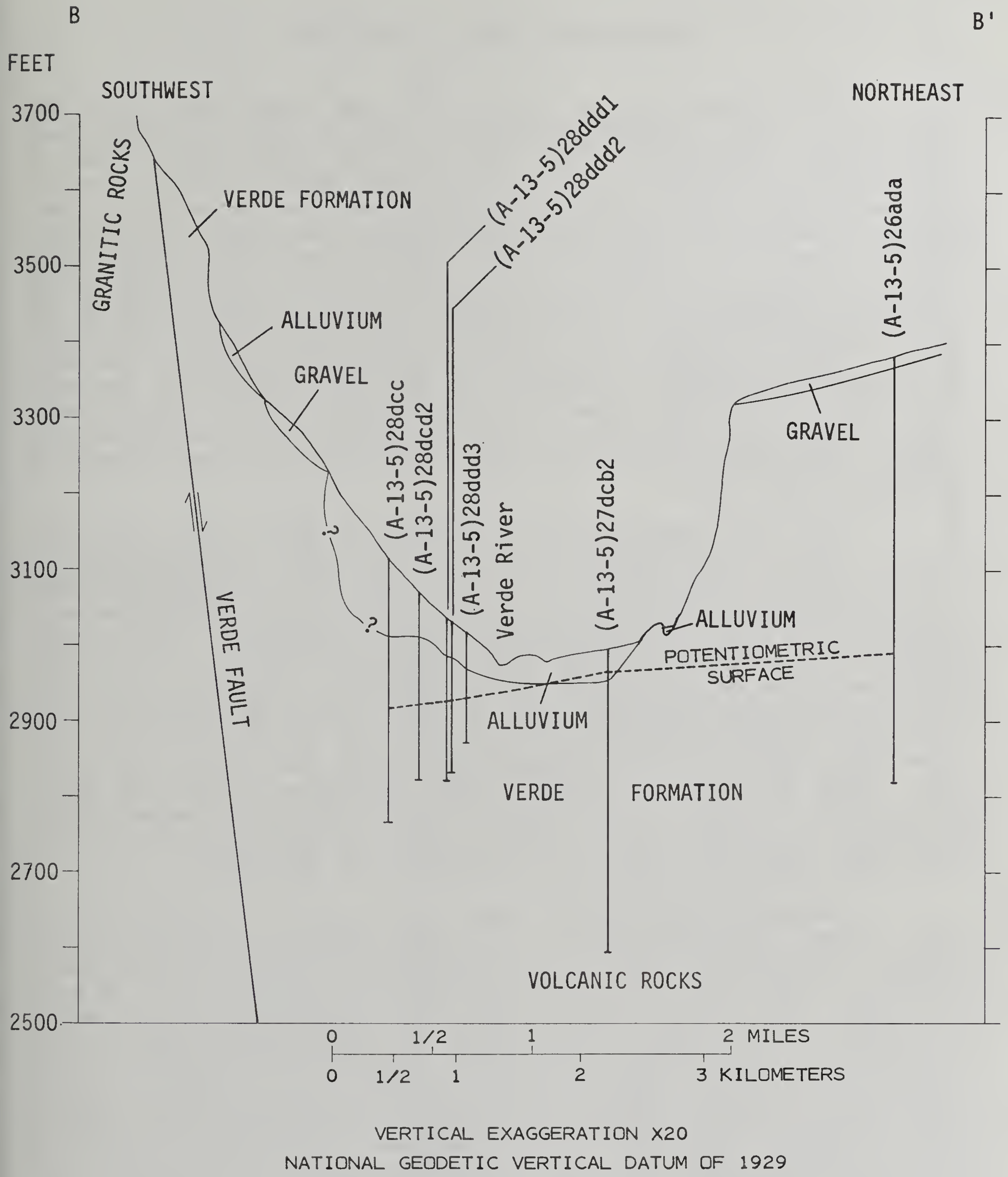


Figure 5.--Geohydrologic section B-B' in secs. 25-28, 32, and 33, T. 13 N., R. 5 E. (Location of section B-B' is shown on plate 1.)

Verde River and Its Tributaries

The Verde River is the main perennial stream that drains the study area. Two interrupted tributaries, Beaver Creek and West Clear Creek, drain a large part of the area east of the Verde River. Water in the streams is diverted and used to irrigate fields. In the summer, irrigation ditches often carry more water than the Verde River, and upstream diversions on the two tributaries leave the creeks dry near the mouths. During the irrigation season, any inflow to the Verde River from the tributary streams occurs as subsurface flow that bypassed the diversion structure. The cross sectional area of the alluvium along the two tributaries determines the amount of subsurface inflow to the Verde River. Tributary streams on the west side of the Verde River flow only in response to rainfall or snowmelt. A detailed discussion of the base flow, availability of streamflow, and water quality for the Verde River, Beaver Creek, and West Clear Creek appears in Owen-Joyce and Bell (1983). The relation between streamflow and the Verde River alluvium is stressed in this report.

Base flow monitored at the Verde River near Camp Verde gage (pl. 2, site 58) from December 1980 to March 1982 is characteristic of average conditions at this site (fig. 6). Base flow at the Verde River near Camp Verde gaging station is ground-water discharge from the area upstream from that site and includes the Camp Verde area. The variation in median base flow for 1935-45 and 1976-79 was from 66 to 200 ft^3/s; base flow ranged from 180 to 240 ft^3/s in January and from 43 to 96 ft^3/s in July (Owen-Joyce and Bell, 1983, p. 34). The large variation is the result of irrigation diversions from streams in the Verde Valley and evapotranspiration along the stream reaches from the headwaters to the gage. Base flow during January in 1981 and 1982 was about 200 ft^3/s. During most of June 1981, the river was at base flow; however, runoff from the thunderstorm season beginning the last week of June kept the river above median base flow for the remainder of the summer.

Irrigation ditches carry water diverted from the Verde River, which is the source of most of the water applied to cropland on the alluvium. Diamond S ditch, on the east side of the river, lies totally within the study area, whereas Woods ditch (Verde Canal) on the west side of the river is only partially within the study area (pl. 2). Water not applied to the fields is returned to the river through gates in the ditches located mostly where the ditches cross tributary channels. Prior to the winter of 1981, water flowed in the ditches all year except during short periods when the ditches were cleaned or high flows washed out the diversion dams. Beginning in late December 1980 through early April 1981, the ditches were dry. It is not known if this is a new operational practice or a one-time occurrence but this condition was considered when data for the 1981 calendar year were analyzed for input into the budget. Another change occurred during June 1981 when Diamond S ditch was out of operation for about 10 days beginning June 5. A conduit was installed under a new bridge to carry the ditch water. This construction effort was underway during the seepage investigation.

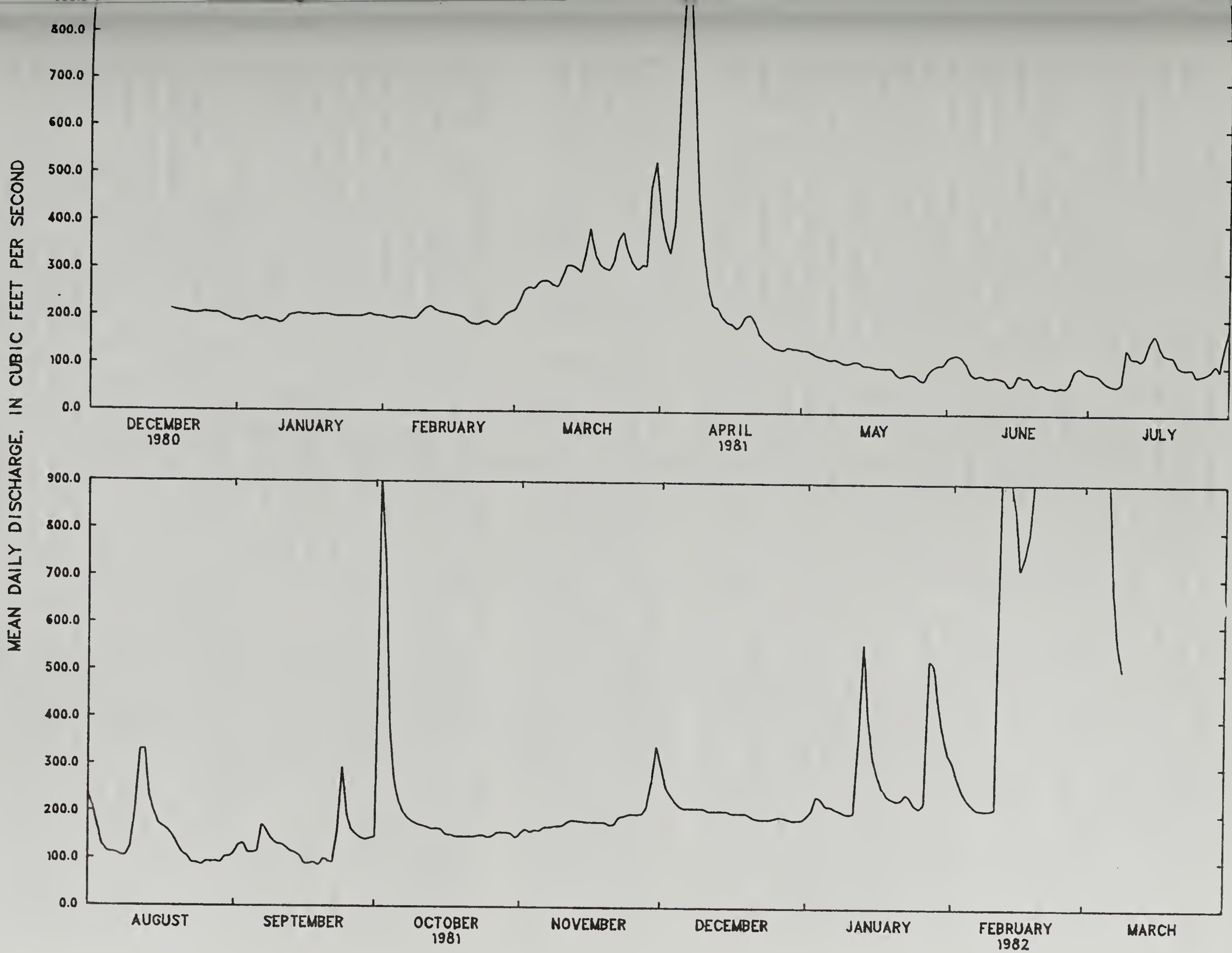


Figure 6.--Flow of the Verde River near Camp Verde from December 1980 to March 1982.

The Verde River and alluvium are hydraulically connected in the study reach. During base-flow conditions, water generally flows from the alluvium into the river. The hydraulic gradient of the ground water in the alluvium next to the Verde River is small (fig. 4); therefore, changes in river stage cause changes in the amount of water in storage in the aquifer. High flows generally result in water-level rises in the alluvium either by infiltration of river water (bank storage) or by a decrease in ground-water outflow from the alluvium (backwater effect). Bank storage is dominant close to the river during a short-term increase in river stage. During runoff events when the stage of the river is high, the hydraulic gradient in the alluvium next to the river is reversed and flow is from the river to the alluvium as shown by water levels in wells near the river. Bank storage quickly drains back to the river once the high flows subside. The backwater effect is dominant throughout the alluvium during long-term increases in river stage, such as sustained high runoff from snowmelt in the spring. Sustained high runoff not only reverses the gradient along the river and increases bank storage but retards the flow of ground water to the river and therefore has an effect on the amount of water that moves through the alluvium. Water levels in wells throughout the alluvium rose in response to the sustained high flows of the winter of 1982. Water stored in the alluvium owing to the backwater effect drains to the river after the high flows subside.

Seepage investigations were limited to periods of base flow as a measure of ground-water discharge during June 1979 (Owen-Joyce and Bell, 1983) and in November 1980 and June 1981 (table 1). A flow event was caused by storm runoff upstream from the study area prior to the June 1981 seepage investigation, but the flow in the river had returned to base-flow conditions from June 8 to 12 (fig. 7).

Base flow is variable because ground-water discharge, evapotranspiration, diversions, and return flows are variable; some of the variations can be quantified or minimized, others cannot. Therefore, streamflow measurements are representative of base flow for the conditions that existed at the time of the measurement. Ground-water discharge may be variable because recharge is variable. Evapotranspiration decreases base flow during the growing season. Evapotranspiration upstream from the gage causes seasonal and daily changes in the amount of base flow in the river. During June, the amount of base flow in the river normally decreases about 1 ft^3/s per day; whereas, in November the amount of base flow normally increases about 0.1 ft^3/s per day as shown by the median base-flow hydrograph (Owen-Joyce and Bell, 1983, fig. 4). Streamflow is variable because of time- and location-dependent changes in the amount of water diverted from and returned to the Verde River. Diversions and water use probably cause the flow in the river to drop below median base flow (fig. 7). During the June 1981 seepage investigation, the river contained an additional 30 ft^3/s more than normal base flow because of the contruction project on Diamond S ditch. Bank storage and runoff into the stream can cause variations in streamflow. Uncertainties inherent in the streamflow measurements are generally less than ±5 percent and need to be considered. During November when the

Table 1.--Discharge data from seepage investigations along the Verde River and West Clear Creek

[E, estimate]

Measurement site[1]	Stream	Date measured	Discharge, in cubic feet per second	Remarks
1	Verde River	Nov. 4, 1980	114	0.25 mi upstream from Beaver Creek.
		Nov. 5, 1980	115	
		Nov. 6, 1980	122	
		Nov. 7, 1980	109	
		June 8, 1981	30.8	
		June 9, 1981	29.2	
		June 11, 1981	25.1	
		June 12, 1981	29.8	
2	Beaver Creek	June 9, 1981	0	Upstream from the confluence with Eureka ditch.
3	Eureka ditch	June 9, 1981	0	Upstream from the confluence with Beaver Creek.
4	Beaver Creek	Nov. 4, 1980	11.4	0.1 mi upstream from mouth.
		June 9, 1981	7.51	
5	Verde River	Nov. 4, 1980	125	0.25 mi downstream from Beaver Creek.
		June 9, 1981	44.2	
6	Woods ditch	June 9, 1981	36.7	Downstream from Montezuma Castle Highway.
7	Verde River	Nov. 5, 1980	E110	0.7 mi upstream from wastewater pond.
		June 9, 1981	47.3	
8	Woods ditch return	Nov. 4, 1980	E2.9	At lower Camp Verde Indian Reservation—did not return to Verde River.
		June 9, 1981	-------	Could not measure—return now in culvert.
9	Woods ditch	June 9, 1981	28.7	Downstream from Main Street.
10	Pump diversion	June 10, 1981	E<1.0	
11	Diamond S ditch	Nov. 4, 1980	33.3	0.4 mi downstream from head.
		June 10, 1981	25.7	
12	Verde River	Nov. 4, 1980	90.4	0.1 mi downstream from wastewater pond.
		June 10, 1981	20.8	
13	Diamond S ditch return	Nov. 4, 1980	4.19	0.4 mi downstream from head.
		June 10, 1981	25.7	
14	Verde River	Nov. 5, 1980	98.9	0.25 mi downstream from bridge and station 09505550.
		June 10, 1981	42.8	
15	Diamond S ditch	Nov. 5, 1980	4.6	0.6 mi downstream from head.
		June 10, 1981	[2]0	
16	Pump diversion	Nov. 5, 1980	2.83	To concrete ditch.
		June 10, 1981	0	
17	Diamond S ditch return	Nov. 5, 1980	5.66	1.2 mi downstream from head.
		June 10, 1981	[2]0	

See footnotes at end of table.

Table 1.--Discharge data from seepage investigations along the Verde River and West Clear Creek--Continued

Measurement site[1]	Stream	Date measured	Discharge, in cubic feet per second	Remarks
18	Verde River	Nov. 5, 1980	105	0.2 mi upstream from Copper Canyon.
		June 10, 1981	44.6	
19	Woods ditch return	Nov. 4, 1980	E0.09	At Copper Canyon.
		June 9, 1981	E0.15	
20	Woods ditch return	Nov. 4, 1980	0	At Double Pipe siphon.
		June 9, 1981	0.87	
21	Woods ditch return	Nov. 4, 1980	10.4	At Ryal Canyon.
		June 9, 1981	E0.03	
22	Verde River	Nov. 4, 1980	122	0.2 mi downstream from Ryal Canyon.
		June 9, 1981	52.7	
23	Verde River	Nov. 5, 1980	125	Upstream from Allen Canyon.
		June 9, 1981	52.8	
24	Woods ditch	June 9, 1981	15.2	Upstream from road to Fort Lincoln.
25	Spring (A-13-5)8dcd	Nov. 5, 1980	0.60	
		June 10, 1981	0.43	
26	Verde River	Nov. 6, 1980	134	At Fort Lincoln.
		June 10, 1981	52.4	
27	Springs	Nov. 6, 1980	E1.0	A number of springs located in the reach upstream from the Verde River measuring site.
28	Verde River	Nov. 6, 1980	157	Just upstream from Diamond S ditch return.
		June 10, 1981	56.3	
29	Springs	Nov. 6, 1980	E4.0	A number of springs downstream from Verde River measuring site and springs that empty into spillway of ditch return.
		June 11, 1981	E0.51	Springs that empty into Diamond S return.
30	Diamond S ditch return	Nov. 6, 1980	14.2	
		June 11, 1981	[2]0	
31	Diamond S ditch return	June 11, 1981	[2]0	
32	Verde River	Nov. 5, 1980	147	0.15 mi upstream from Squaw Peak Canyon.
		June 10, 1981	65.4	
33	Woods ditch return	Nov. 5, 1980	0	At Squaw Peak Canyon.
		June 10, 1981	0	
34	Verde River	Nov. 6, 1980	155	0.4 mi downstream from Squaw Peak Canyon.
		June 10, 1981	57.8	
35	Woods ditch return	Nov. 6, 1980	0	Near Hat Ranch and 0.5 mi downstream from Squaw Peak Canyon.
		June 11, 1981	E0.16	
36	Pump diversion	Nov. 3, 1980	0	Pump removed, 0.5 mi downstream from Squaw Peak Canyon.
		June 10, 1981	0	Pump installed but not operating.

See footnotes at end of table.

Table 1.--Discharge data from seepage investigations along the Verde River and West Clear Creek--Continued

Measurement site[1]	Stream	Date measured	Discharge, in cubic feet per second	Remarks
37	Verde River	Nov. 6, 1980 Nov. 7, 1980 June 10, 1981	155 143 59.2	0.1 mi upstream from West Clear Creek.
38[3]	West Clear Creek	June 9, 1981	13.8	Near Camp Verde gaging station, 09505800, 11 mi upstream from mouth.
39[3]	West Clear Creek	June 9, 1981	15.0	9.9 mi upstream from mouth.
40[3]	West Clear Creek	June 9, 1981	13.8	6.0 mi upstream from mouth.
41	Ditch diversion	June 9, 1981	5.23	
42	West Clear Creek	June 9, 1981	7.22	4.8 mi upstream from mouth.
43	Oitch return	June 9, 1981	E1.5	Just downstream from measuring site 40.
44	Ditch	June 9, 1981	3.19	
45	West Clear Creek	June 9, 1981	6.57	4.0 mi upstream from mouth.
46	Oitch return	June 10, 1981	E0.3	0.45 mi northeast of measuring site 45.
47	West Clear Creek	June 10, 1981	7.84	3.1 mi upstream from mouth.
48	West Clear Creek	June 10, 1981	5.25	2.3 mi upstream from mouth.
49	West Clear Creek	June 10, 1981	E3.0	1.6 mi upstream from mouth.
50	Ditch	June 10, 1981	E3.0	0.2 mi north of measuring site 47.
51	West Clear Creek	Nov. 6, 1980 June 11, 1981	E7.0 0	At the mouth—1.5 ft^3/s measured surface flow and the rest estimated seepage at the Verde River.
52	Verde River	Nov. 7, 1980 June 11, 1981	160 79.9	0.6 mi downstream from West Clear Creek.
53	Verde River	Nov. 6, 1980 June 11, 1981	158 76.7	1.6 mi downstream from West Clear Creek.
54	Woods ditch	Nov. 6, 1980 June 11, 1981	0 0	0.25 mi upstream from end of ditch. Ditch wet with ponded water—no flow.
55	Woods ditch	June 11, 1981	0	Ditch dry and full of weeds.
56	Verde River	Nov. 7, 1980 June 11, 1981	161 72.0	At Beasley Flat.
57	Verde River	June 11, 1981	77.4	0.3 mi upstream from The Falls.
58	Verde River	Nov. 7, 1980 June 8, 1981 June 11, 1981	163 92.8 89.4	Near Camp Verde gaging station 09506000.

[1]Measurement-site numbers correlate to locations plotted on plate 2.
[2]Diamond S ditch was out of operation during the June 1981 seepage investigation.
[3]Measurement-site numbers correlate to locations plotted on figure 1.

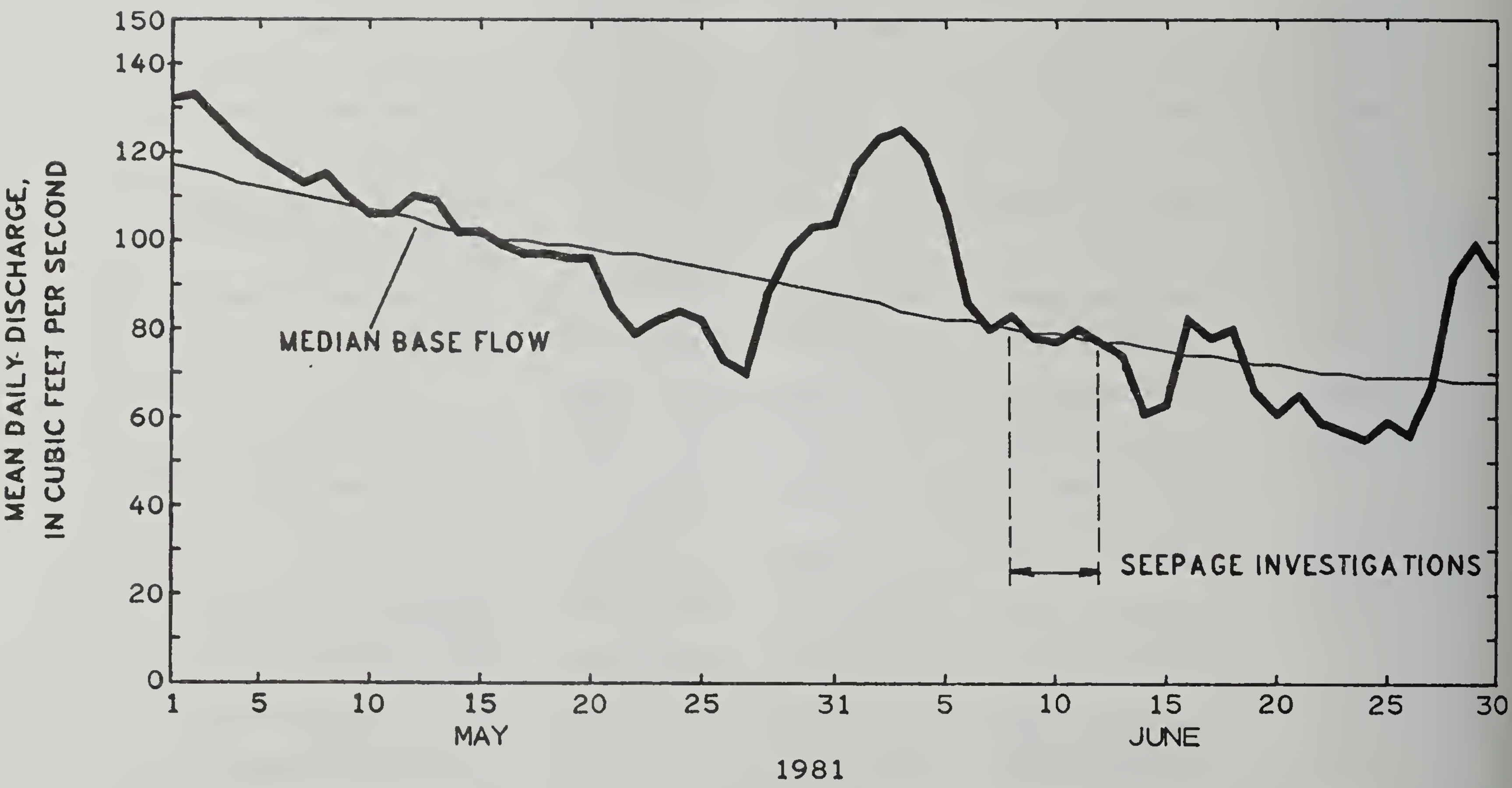


Figure 7.--Flow of the Verde River near Camp Verde during May and June 1981 and median base-flow conditions from 1935-45 water years.

effects of evapotranspiration and irrigation are low, the higher flows in the river can mask a small ground-water inflow component, which makes it difficult to detect or isolate the inflow. During June when smaller flows in the river allow better resolution because the uncertainty is smaller, evapotranspiration and irrigation diversions are largest.

Seasonal variations in the quantity of water that discharges from the alluvium to the river were documented by the seepage investigations. Evapotranspiration is seasonal but is insufficient to account for the variations in the amount of base flow from June to November in the study reach. Application of irrigation water is also seasonal and is sufficient to cause the variation in the amount of base flow. The amount of ground water that discharges to the river is a function of the amount of water applied to the fields. Increasing the hydraulic head under the fields increases the hydraulic gradient and saturated thickness of the alluvium; therefore, larger quantities of ground water move toward and discharge into the river.

Daily and short-term fluctuations in the flow of the Verde River occur in addition to the seasonal variations owing to irrigation and evapotranspiration. The installation of a temporary gaging station on the Verde River upstream from Beaver Creek (pl. 2, site 1) during the June

1981 seepage investigation provided some additional information regarding daily fluctuations in flow that need to be considered in interpreting the relation between consecutive streamflow measurements. The streamflow record at the temporary gage showed the results of evapotranspiration and irrigation diversions and return flows upstream from the study area. Evapotranspiration causes a diurnal fluctuation in flow in the river; however, the magnitude of the fluctuation varies along the river. The average diurnal fluctuation at the temporary gage upstream from Beaver Creek (pl. 2, site 1) was 7 ft^3/s; whereas, at the Verde River near Camp Verde gage (pl. 2, site 58), the average diurnal fluctuation was 14 ft^3/s (fig. 8). In June 1978, the diurnal fluctuation at a discontinued gaging station about halfway between sites 1 and 58 and about 500 ft upstream from measuring site 14 (pl. 2) was less than 2 ft^3/s. Diurnal fluctuations are dampened downstream from diversions because part of the fluctuation is diverted with the water from the river; a greater percentage of the flow in the river is diverted at the peak of the diurnal than at the trough. Variable amounts of flow returning directly from the ditches and as subsurface return flow to the river are superimposed on the diurnal fluctuations.

Three seepage investigations that represent different conditions along the study reach support the theory that irrigation on the alluvium controls the amount of subsurface return flow to the river. A seepage investigation was made in November 1980 at a time when the effects of evapotranspiration and irrigation on flow in the river were small to determine what portion of the gain in river flow was ground-water discharge from the alluvium and Verde Formation. A variation in gains throughout the year was indicated when the gain measured in November 1980 did not agree with the gain measured in the June 1979 seepage investigation. The comparison indicated a smaller gain during November 1980 than during June 1979, which correlates with the lower application rate of irrigation water and indicated that any natural ground-water discharge may be smaller than the detection limits or that all the gains are from irrigation. A subsequent seepage investigation in June 1981 did not duplicate the results of that in June 1979 because of an unusual condition—Diamond S ditch was out of operation during the June 1981 investigation (pl. 2). Using the actual quantities from the streamflow measurements, a comparison between gains in the river and the amount of applied water available for return during the two June seepage investigations showed a difference of 5 percent. Inherent errors owing to the discharge measurements being made on different days over a 5-day period, traveltime of the water through the reach, and diurnal fluctuations in flow make meaningful determination of the relation between consecutive measurements impossible. However, the nature of the difference between the two June seepage investigations strongly supports the significant impact of irrigation on the outflow from the alluvium.

Seasonal changes in streamflow caused by irrigation on the alluvium along the Verde River are shown by the seasonal variations in streamflow gains in the Verde River near the mouth of Beaver Creek (table 1). Beaver Creek meanders through a narrow canyon cut into the Verde Formation; a thin deposit of alluvium lies at the bottom of the

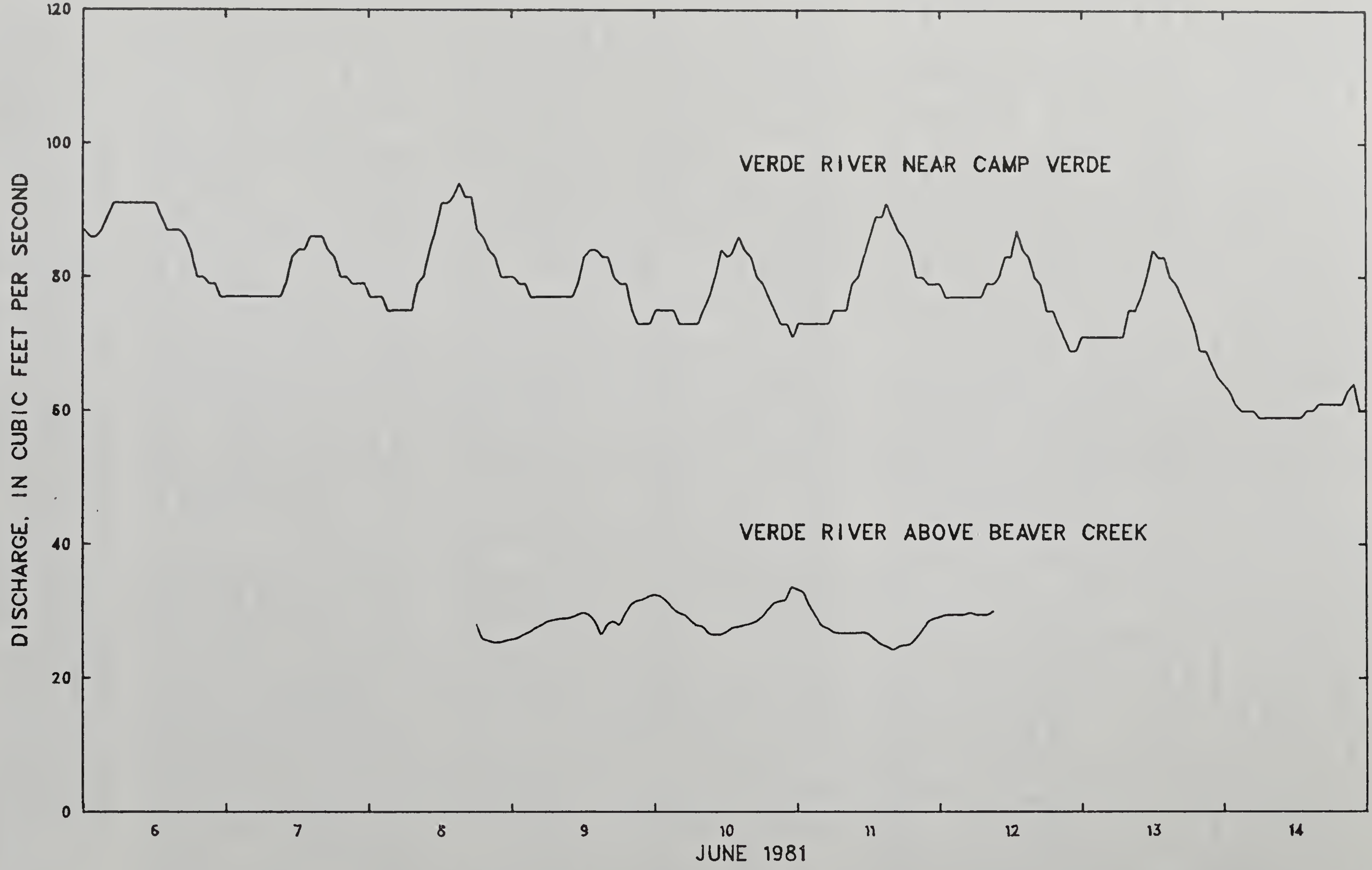


Figure 8.--Flow of the Verde River near Camp Verde, June 6-14, 1981, and Verde River above Beaver Creek, June 8-12, 1981.

canyon upstream from measuring site 2 (pl. 2). The alluvium along Beaver Creek widens downstream from site 2 and interfingers with Verde River alluvium starting about 0.3 mi above the mouth. The thin deposit of alluvium carries little subsurface flow, if any, from Beaver Creek upstream from site 2; therefore, all inflow from the Beaver Creek drainage area to the Verde River would be present at site 2 as surface flow. During the irrigation season, water is diverted upstream from the study area, which leaves the creek dry at site 2. The alluvium deposited by the Verde River near the mouth of Beaver Creek is irrigated using water diverted into Eureka ditch (pl. 2) from the Verde River 0.75 mi south of Oak Creek (fig. 1).

The amount of streamflow at the mouth of Beaver Creek during June 1979 was assumed to be related to irrigation (Owen-Joyce and Bell, 1983); additional data from this study supports this assumption. During the June 1981 seepage investigation, Beaver Creek upstream from the mouth of the Eureka ditch and the ditch were dry (pl. 2, sites 2 and 3; table 1). Flow at the mouth of Beaver Creek accounted for 7.51 ft^3/s of the 15 ft^3/s streamflow gain in the Verde River between measuring sites 1 and 5 (pl. 2). The other half of the gain is attributed to ground-water outflow from the alluvium to the Verde River in this reach. During the November 1980 seepage investigation, no increase in flow between sites 1 and 5 could be attributed to ground-water outflow from the alluvium. The quantity of streamflow gain attributed to ground-water outflow in June is either not present during November when irrigation is minimal or the quantity present in November is much less than in June and is masked by the increase in river discharge. The amount of streamflow in Beaver Creek and the ground-water outflow from the alluvium in June 1981 appear to be from irrigation in the summer and are not present in the winter when all the flow in Beaver Creek originates upstream from the irrigated area near the mouth of the creek.

Water chemistry indicates that the source of water in Beaver Creek at the mouth probably changes during the year. Water chemistry at the mouth of Beaver Creek in June 1981 showed a closer comparison with Verde River water diverted into Eureka ditch than surface water in Beaver Creek upstream from the study area. Data at all three sites were not available for the same year but were available during the month of June for 3 consecutive years for base-flow conditions: 1979, Verde River below the head of Eureka ditch (Owen-Joyce and Bell, 1983); 1980, site VV12 on Beaver Creek below Lake Montezuma (Milne, 1981); and 1981, Beaver Creek upstream from the mouth from the June seepage investigation. Specific-conductance data for November 1980 are available for Beaver Creek at the mouth and below Lake Montezuma; the values equal each other and indicate the source of surface water at the mouth of Beaver Creek in November is not ground-water outflow from the alluvium as it is in June. Water-quality data for Eureka ditch were not available at this time of year.

Inflow from West Clear Creek accounts for the most significant gain in streamflow in the Verde River within the study area. Near the mouth of West Clear Creek, most of the water from this drainage area

flows in the alluvium as subsurface flow during periods of base flow. West Clear Creek flows in a canyon upstream from site 45 (pl. 2) where the alluvium is less than 0.2 mi wide and is composed chiefly of volcanic boulders. Downstream from site 45, the alluvium increases to about 1 mi wide near the mouth. The alluvium is composed of volcanic boulders from upstream and reworked Verde Formation washed in from tributary streams to the north. In the West Clear Creek drainage area, the alluvium ranges in thickness from 0 to about 50 ft. Details on the quantity of flow and water quality are discussed under the appropriate water-budget components in this report.

Alluvium

The alluvium in the study area was deposited by the Verde River, West Clear Creek, and Beaver Creek and as the result of slope wash. The alluvium deposited by the Verde River lies within about 0.5 mi of the river. The sand and gravel units are saturated at depth and form a water-table aquifer. Near the river, water levels in wells are influenced by the stage of the river. The alluvium deposited by West Clear Creek interfingers with the Verde River alluvium near the mouth of West Clear Creek. West Clear Creek drains an area of Paleozoic and volcanic rocks (Owen-Joyce and Bell, 1983) and the channel deposits reflect the source area; a fan-shaped deposit of volcanic boulders is deposited at the mouth of the creek. This deposit at the mouth is permeable and is considered part of the alluvium along the Verde River. At the mouth of Beaver Creek, the alluvium deposited by Beaver Creek interfingers with the alluvium deposited by the Verde River. Slope-wash alluvium from the Black Hills, in parts of secs. 28, 29, 32, and 33, T. 13 N., R. 5 E., is composed of granitic material (pl. 1). The slope-wash alluvium is permeable and transmits water downslope, but in most places it lies above the water table and does not provide water to wells.

The water-bearing alluvium includes the channel, flood-plain, and terrace deposits in and near the perennial and intermittent streams (pl. 1). These deposits are unconsolidated and consist of gravel, sand, silt, and clay. The size of the material in the alluvium differs laterally as well as with depth. The terrace and flood-plain deposits usually have fine-grained material at the surface and become coarse grained with depth. In some areas, the terrace deposits contain reworked Verde Formation. The channel deposits are coarse grained, and are generally less than 60 ft thick. Where the slope-wash deposits interfinger with the river deposits, however, the alluvium may be as much as 100 ft thick (pl. 1).

Recharge to the alluvium occurs from infiltration of precipitation, streamflow, irrigation water and septic-tank effluent, and inflow from the Verde Formation where the hydraulic head in the Verde Formation is higher than in the alluvium. Infiltrating water percolates to the water table and then moves downgradient toward the Verde River. The

altitude and configuration of the water table is shown on plate 2. The gradient of the water table is toward the river, which indicates a gaining stream. Some ground water is intercepted by wells, some is used by phreatophytes and riparian vegetation, and some infiltrates to the Verde Formation where the hydraulic head in the Verde Formation is lower than in the alluvium; the remainder is discharged to springs and to the Verde River. In the reach near measuring site 23 and between sites 37 and 52, the ground-water gradient is toward the river on the east side and away from the river on the west side, which indicates ground-water flow through the alluvium beneath the river (pl. 2).

In wells where the principal aquifer is the alluvium, water levels range from about 5 to 50 ft below the land surface and fluctuate seasonally. Well depths range from about 12 to 120 ft below the land surface. The deeper wells bottom in the Verde Formation, generally in clay, which provides little water, if any, to the well. Saturated thickness ranges from 0 to about 30 ft (fig. 9). Water levels were measured periodically in 16 wells from February 1981 to March 1982 on both sides of the river and under different land-use conditions to document fluctuations and probable causes of the fluctuations. Water levels measured in 1981 fluctuated as much as 5 ft. The fluctuations in water levels are caused by changes in the stage of the river and by deep percolation of applied irrigation water on fields located on the alluvium.

The influence of river stage on water levels in wells is dependent on the amount of stage increase, distance of the well from the river, water-table gradient, and aquifer characteristics. Water-level fluctuations that result from river-stage fluctuations decrease with increasing distance from the river. Distances to the wells were measured along flow lines and upgradient from the river. December 1980 to March 1981 was mild and dry; the river ran at base flow until snowmelt and rains increased runoff in March (fig. 6). Water levels in wells east of the river in sec. 7, T. 13 N., R. 5 E., responded to the increase in river stage by rising above previous levels. Water-level rises ranged from 1.3 ft in well (A-13-5)7dba1 to 0.4 ft in well (A-13-5)7dba4 (fig. 10). Water levels in wells within 800 ft of the river rose in response to river-stage increases and quickly returned to the levels prior to the stage increase in response to river-stage decreases. Water levels in wells about 1,100 ft from the river rose but did not return to prior levels owing to the start of irrigation. November 1981 to March 1982 was cold and wet; rains and snowmelt increased the runoff in February to a much higher level than the previous year (fig. 6). Water levels in wells as far as 2,500 ft from the river in secs. 6 and 7, T. 13 N., R. 5 E., reacted to the greater increase in river stage. The rise in water levels ranged from 2.0 ft in well (A-13-5)7dba1 to 0.5 ft in well (A-13-5)7abc1. The water level in well (A-13-5)7aac1 did not show a rise above the previous level but the decrease in slope of the hydrograph illustrates a response to the increase in river stage (fig. 10). Water levels in wells on the west side, as far as 800 ft from the river in sec. 6, T. 13 N., R. 5 E., reacted to the increased river stage (fig. 10). The water level in well (A-13-5)6ccc2 rose 1.3 ft above the previous level; the decrease

EXPLANATION

AREAS WHERE THE SATURATED THICKNESS RANGES FROM 20 TO LESS THAN 30 FEET

AREAS WHERE THE SATURATED THICKNESS RANGES FROM 10 TO LESS THAN 20 FEET

AREAS WHERE THE SATURATED THICKNESS IS LESS THAN 10 FEET

AREAS WHERE THE ALLUVIUM IS UNSATURATED

GEOLOGIC CONTACT—Dashed where approximately located. Indicates the outcrop area of the alluvium

BOUNDARY OF ZONED AREAS OF SATURATED THICKNESS IN THE ALLUVIUM—Dashed where approximately located

BOUNDARY OF THE ALLUVIUM FOR CALCULATING STORAGE WHERE THE AQUIFER IS CONTINUOUS

Figure 9

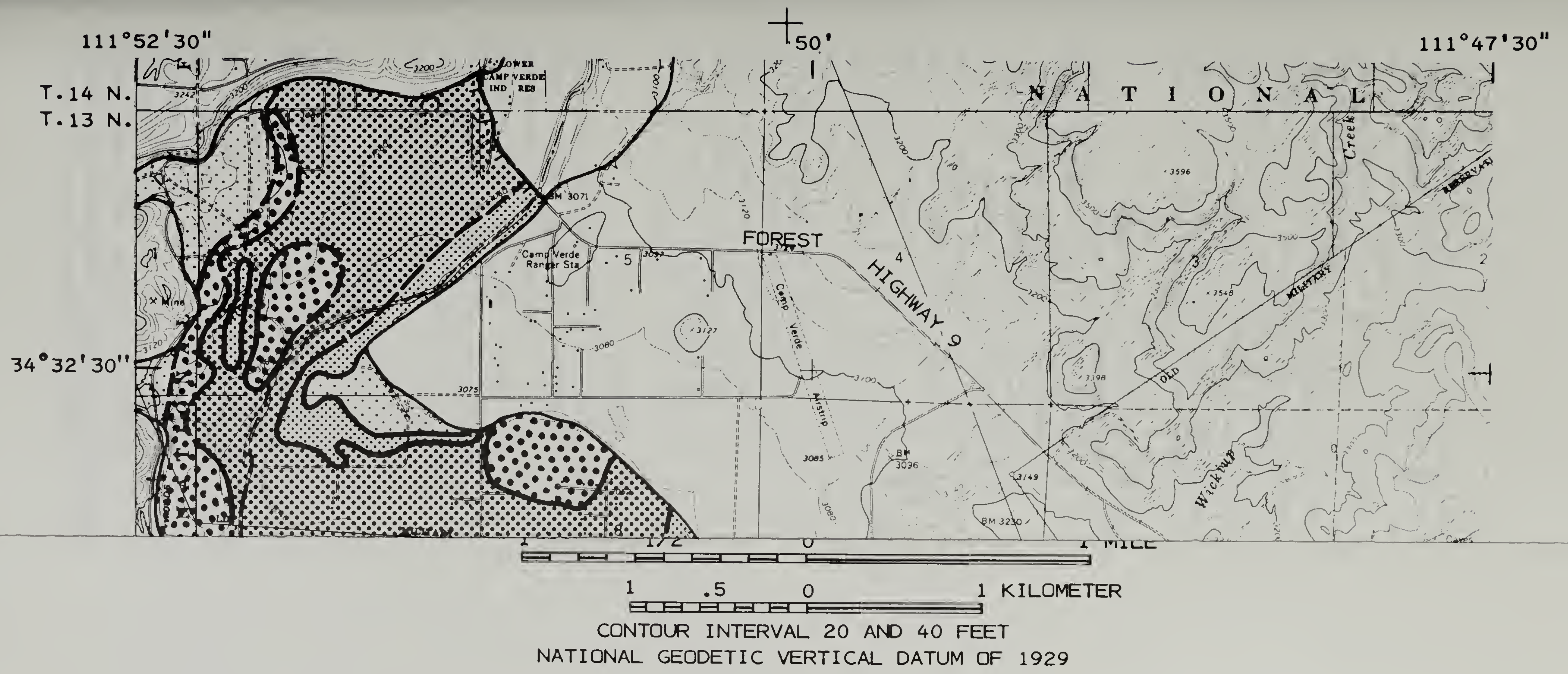


Figure 9.--Saturated thickness of the alluvium along the Verde River, winter 1981.

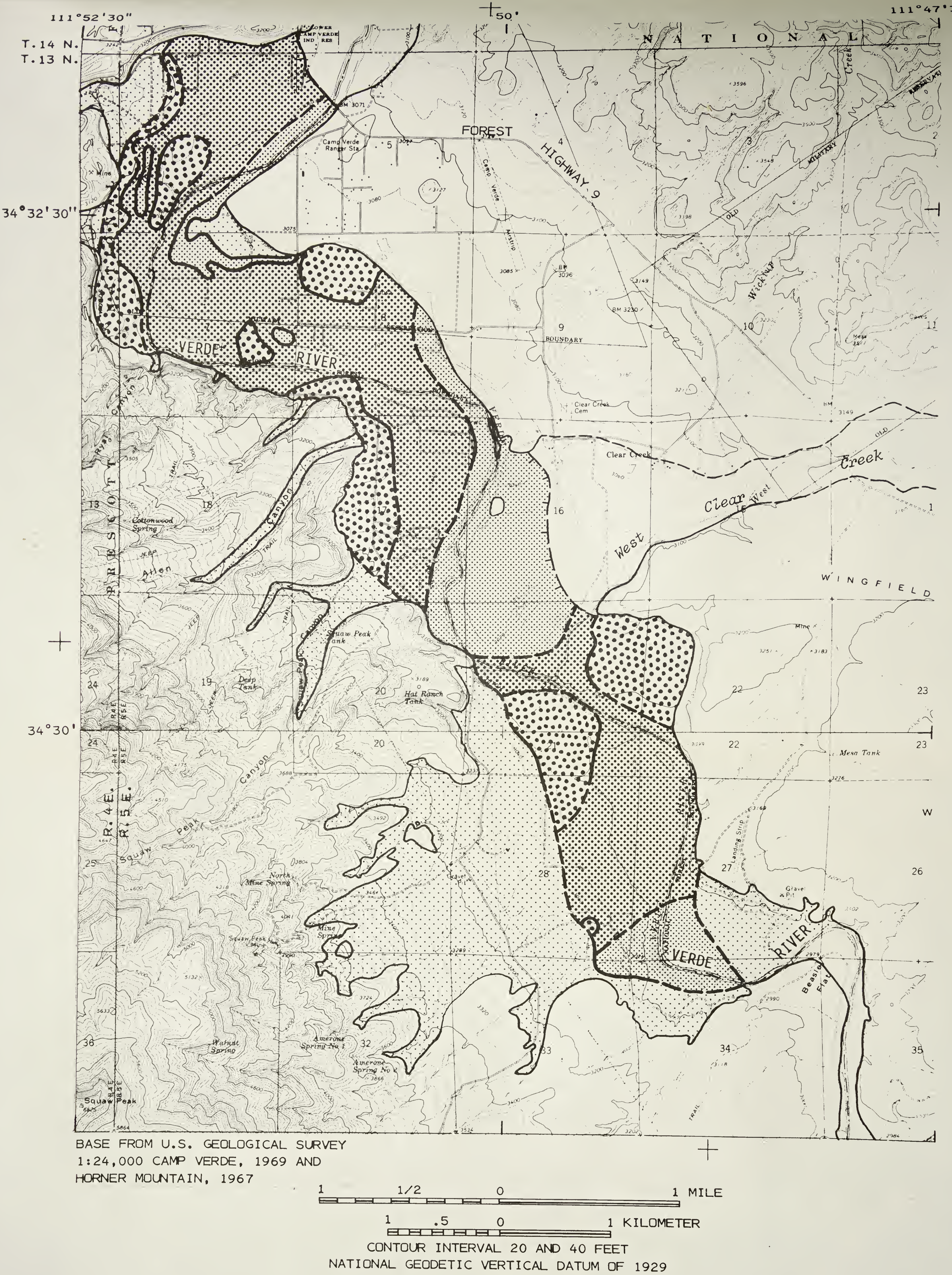


Figure 9.--Saturated thickness of the alluvium along the Verde River, winter 1981.

in the slope of the hydrograph for well (A-13-5)6ccc1 illustrates the response to higher river stage although the water level did not rise above the previous level. Hydrographs for wells 1,000 ft from the river showed little change in slope in response to the increase in river stage. On opposite sides of the river, changes in river stage influence water levels in wells at different distances from the river, which is a function of the difference in ground-water gradients on opposite sides of the river. The ground-water gradient is steeper on the west side of the river in sec. 6 than the ground-water gradient east of the river in secs. 6 and 7 (pl. 2). The steeper the gradient the larger the change in river stage needed to influence water levels in wells farther away from the river.

Water-level fluctuations caused by deep percolation of irrigation water were most noticeable in wells farthest from the river. Wells on both sides of the river showed the same seasonal trend of water-level fluctuation, although the amount of change was different. This difference could be caused by differences in the areal distribution of irrigated areas and the amount of water applied to the fields or the amount reaching the water table, because of differences in crop type, infiltration rates, or both. On the east side of the river where the wells are located in secs. 6 and 7, T. 13 N., R. 5 E., the land is irrigated. In sec. 7, T. 13 N., R. 5 E., the water level in a well within 800 ft of the river rose less than 0.5 ft owing to irrigation (fig. 10). This small water-level rise is due in part to the river being at its lowest stage during the irrigation season because river water is diverted into irrigation ditches and evapotranspiration is at its maximum rate. The water level in a well 550 ft from the river showed a greater response to a flow peak in the river during October than from irrigation (figs. 6 and 10). On the west side of the river in sec. 6, T. 13 N., R. 5 E., the land around the wells is not irrigated but land to the northeast and south is irrigated.

The amount of ground water stored in the alluvium is variable throughout most of the year because the principal component of inflow is deep percolation of irrigation water. If a 1-year period is used, however, net changes in ground-water storage are probably negligible. Base flow in the river, ground-water heads, and irrigation-water deliveries generally follow a 1-year cycle. Water-level fluctuations normally reflect changes in the saturated thickness and in the amount of ground water stored in an aquifer.

The amount of ground water stored in the alluvium can be estimated using saturated thickness and porosity. About 65 percent of the area underlain by alluvium, or 3,400 acres, contains saturated material. The total volume of saturated alluvium—about 50,000 acre-ft—was calculated using values of saturated thickness from water levels measured from February to April 1981 before the start of the irrigation season (fig. 9). The amount of ground water stored in the alluvium is estimated to be 17,500 acre-ft using an assumed porosity of 35 percent (Freeze and Cherry, 1979; Todd, 1959). Saturated thickness and therefore the amount of water in storage increases over about half the area of saturated alluvium during irrigation. After irrigation, water levels in most wells returned to within 0.5 ft of pre-irrigation levels. A

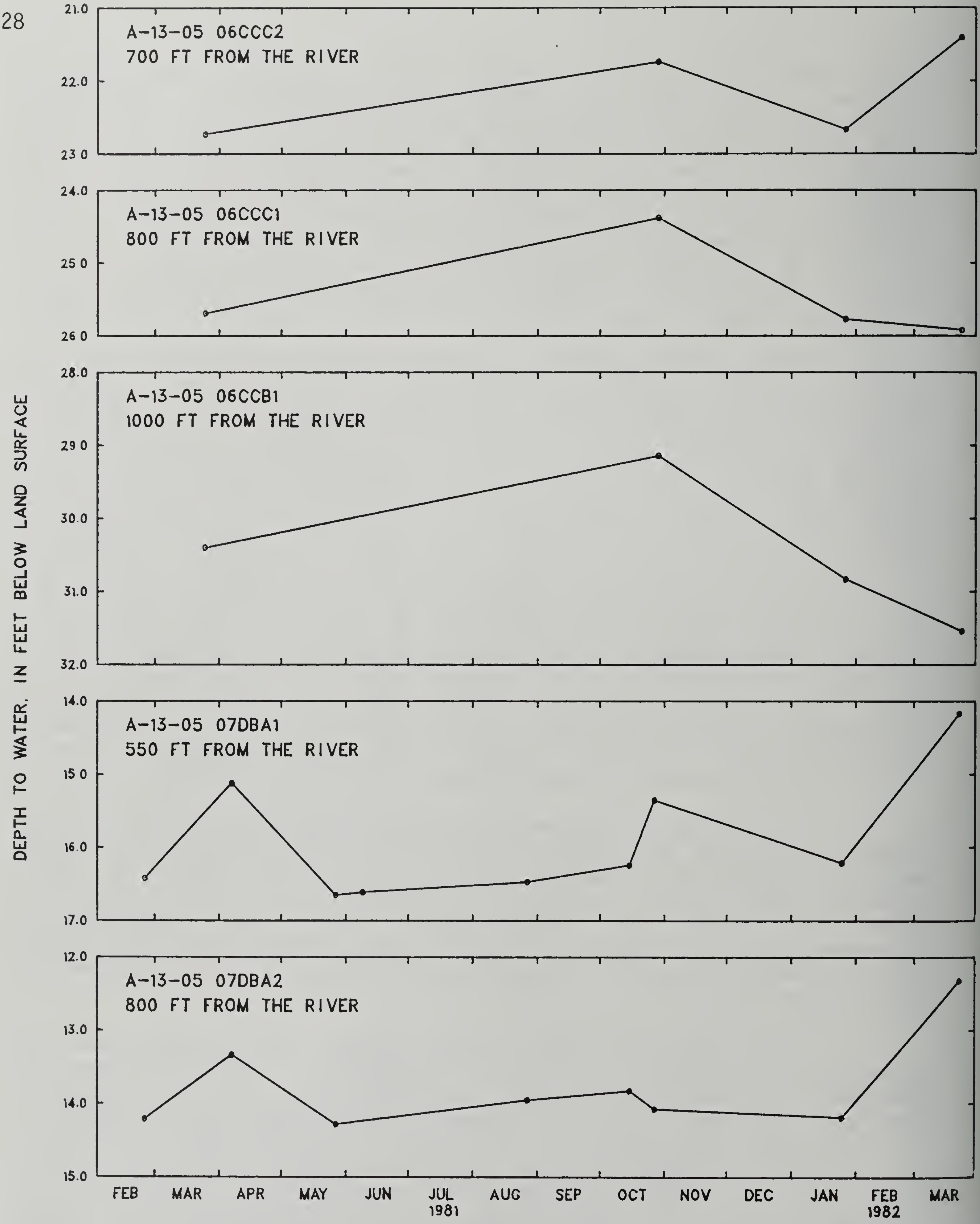


Figure 10.--Water levels in selected wells in the alluvium.

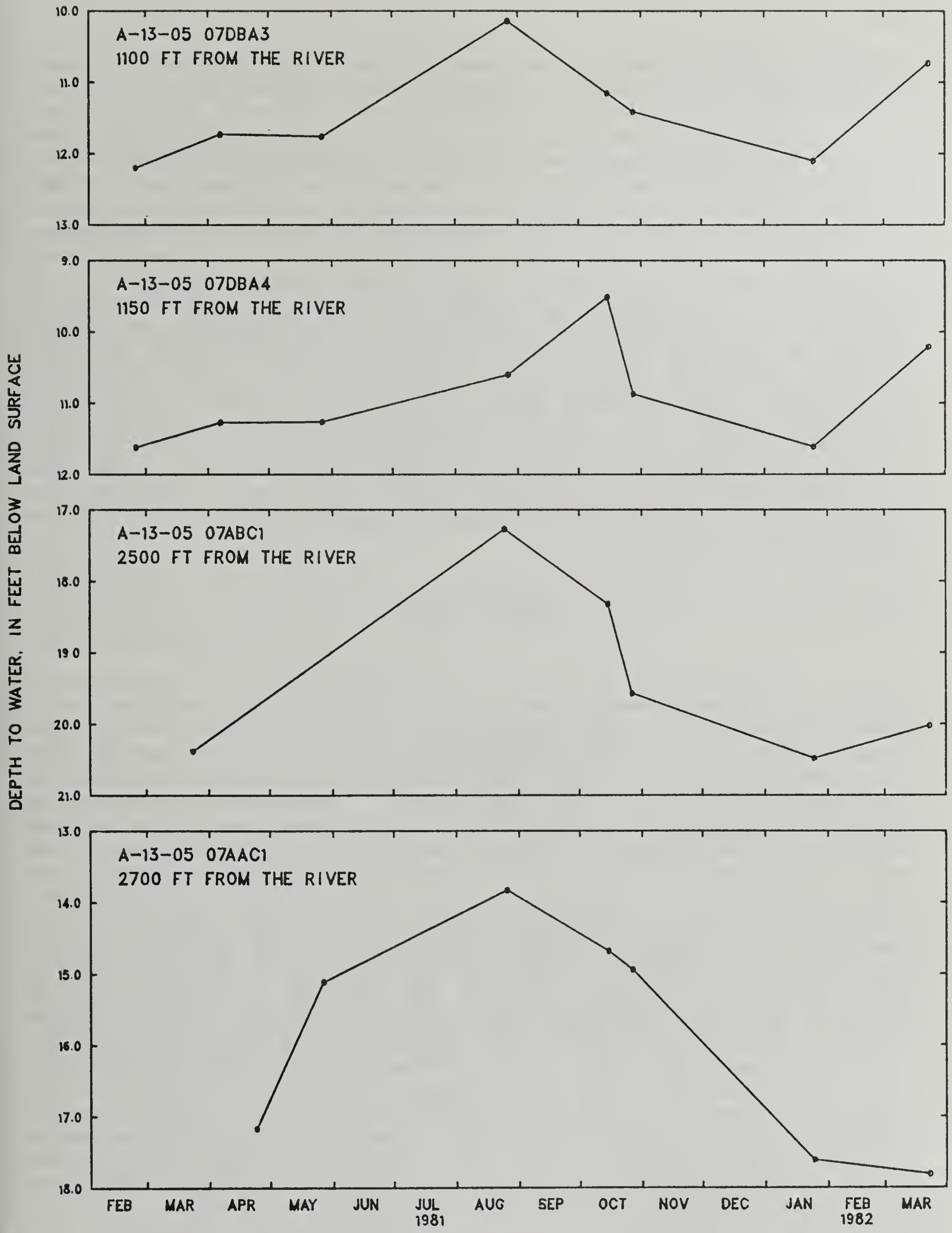


Figure 10.--Continued

change of 0.5 ft in water levels over half the area of saturated alluvium would result in a net change in storage of about 300 acre-ft.

Well yields are a function of the hydraulic conductivity, thickness of the aquifer penetrated, and well construction and development. In short-term tests, wells completed in the alluvium yielded from 3 to 300 gal/min. Hydraulic conductivity is dependent on the lithology and degree of cementation of the rock unit. Wells produce water where they penetrate sand and gravel below the water table in the alluvium. Wells do not yield usable quantities of water when they penetrate only silt and clay in the alluvium. In some places the alluvium is above the water table and is dry (fig. 9). Most wells in the alluvium are fully penetrating and bottom in the top few feet of the Verde Formation, but saturated thickness differs from place to place and varies during the year. Wells have similar construction characteristics and generally are similar in diameter according to their use. Domestic wells are 6 or 8 in. in diameter, and irrigation wells are 10 or 12 in. in diameter. Almost all wells are cased to the top of the Verde, and are perforated in the alluvium. Some wells are drilled deeper into the Verde Formation and are open to both sources of ground water. Water-quality anomalies generally indicate wells that are open to both rock units.

Verde Formation

Ground water in the Verde Formation occurs in the limestone, sandstone, and conglomerate beds and is confined by interbedded mudstone, claystone, and basalt flows. The Verde Formation underlies the alluvium and is composed of sediments deposited in an ancient lake (Twenter and Metzger, 1963). The distribution of the Verde Formation in the Camp Verde area is shown on plate 1. The main rock units in the formation characteristic of most of the area are limestone, mudstone, and claystone. The limestone is found mainly in the northern part of the area. In the southern part of the valley near the southern extent of the Verde Formation, the formation is composed of sandstone, conglomerate, and tuffaceous rocks. Evaporite minerals, mainly sulfate salts, are interbedded with the mudstone and claystone. A blue clay bed is the topmost rock unit of the Verde Formation on the west side of the area south of Camp Verde and underlies most of the alluvium. Volcanic rocks of Tertiary age are interbedded with the lake deposits. Coarse-grained materials were deposited along the margins of the valley, whereas the fine-grained materials were carried farther into the central part of the valley and deposited. The west boundary of the Verde Formation is the Verde Fault where the Verde Formation is in contact with Precambrian and Paleozoic rocks (pl. 1). At the other boundaries, the Verde Formation overlaps Paleozoic rocks or interfingers with volcanic rocks. Descriptions of the individual rock units are given in Twenter and Metzger (1963) and Owen-Joyce and Bell (1983).

The total thickness of the Verde Formation is unknown; however, locally the formation is at least 1,800 ft thick (Twenter and

Metzger, 1963, p. 55). Holes drilled in the Verde Formation range in depth from 24 to 1,625 ft below the land surface. Most water wells are less than 500 ft deep. Oil test holes show the Verde is 1,400 ft thick in sec. 10, T. 13 N., R. 5 E., and 1,225 ft thick in sec. 9, T. 13 N., R. 5 E. In both test holes the Verde Formation is underlain by volcanic rocks. More recent drilling data show that 400 ft of Verde overlies volcanic rocks in sec. 27, T. 13 N., R. 5 E., and 550 ft overlies Paleozoic rocks (Supai Formation) in sec. 26, T. 14 N., R. 5 E.

The Verde Formation provides a water supply where the alluvium is absent or will not produce a sufficient supply. Recharge results from infiltration of precipitation and streamflow and from underflow from the Paleozoic rocks on the east side of the area. Where the Verde Formation overlaps Paleozoic rocks, ground water flows from the Paleozoic rocks into the Verde Formation. This transition is marked by a sharp change in the ground-water gradient (pl. 2). Ground water moves downgradient toward the Verde Fault as shown by the configuration of the potentiometric surface depicted on plate 2. Some ground water is intercepted by wells, some is discharged to springs, some may discharge to the Verde River as seepage where the Verde Formation crops out in the river channel, and some moves into the alluvium where the hydraulic head in the Verde Formation is higher than in the alluvium. Most of the ground water moves downgradient through the Verde Formation southwestward toward the Verde Fault zone (fig. 5) where the water probably flows southeastward along the faults and fractures.

Water levels in wells that tap the Verde Formation range from flowing at the land surface near the river south of Camp Verde to about 390 ft below the land surface on Wingfield Mesa. Water-level measurements were made in well (A-13-5)7aba2 (fig. 11) and the water level fluctuated within about a 1-foot interval between March 1981 and March 1982. The water-level fluctuation follows the same trend as water levels in the alluvium nearby, which indicates the hydraulic connection between the aquifers.

Well yields are dependent on location because of areal and vertical changes in the lithology of the rock units that make up the formation and the lenticular nature of the deposits. Well yields range from 10 to 2,000 gal/min on the basis of data from short-term tests by drillers. High yields occur in the sandstone and conglomerate and where the limestone contains solution channels, fractures, and joints.

QUANTITY AND CHEMICAL QUALITY OF WATER IN THE ALLUVIUM

To aid in understanding the hydrologic system, a water budget for the 1981 calendar year was compiled for that part of the alluvium along the Verde River that extends from the Forest Highway 9 and the bridge over the Verde River in the NW¼ sec. 5, T. 13 N., R. 5 E., to

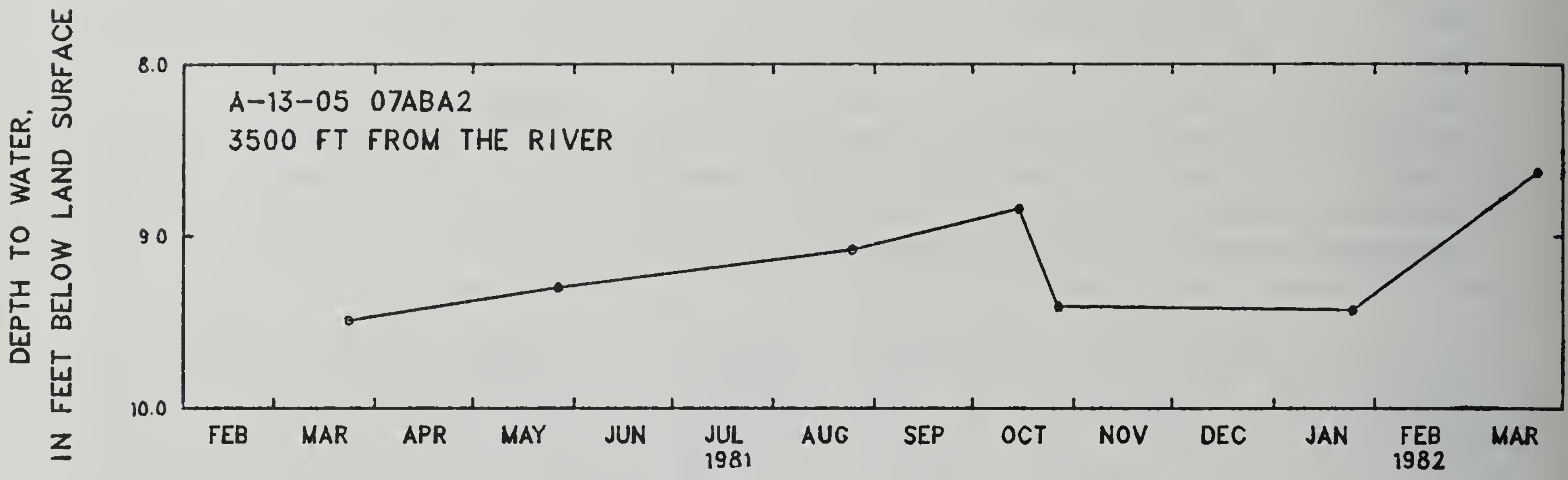


Figure 11.--Water levels in a well in the Verde Formation.

the south boundary of the alluvium (pl. 2). The area of alluvium considered in the budget is 8.2 mi^2. Ground water does not flow across the northeast boundary because the boundary is a flow line and parallels the direction of ground-water movement. The boundary along West Clear Creek approximates the dividing line between the alluvium deposited by the Verde River from that deposited by West Clear Creek. All other boundaries are defined by the outcrop pattern of the alluvium in the area (pl. 2).

The water budget was used to identify the inflow and outflow components and to estimate the relative magnitude of each component. The ground-water system in the alluvium is in dynamic equilibrium, and the annual change in storage is assumed to be zero. Each of the major inflow components provides water of a different quality, which results in differences in water quality in the alluvium. Changes in water quality provided information on how the hydrologic system functions during a year. Deep percolation of irrigation water diverted from the Verde River flushes the alluvium; locally, inflow from the underlying Verde Formation increases the concentrations of some constituents.

Inflow to the Alluvium

Inflow to the alluvium occurs as infiltration of precipitation, subsurface inflow from West Clear Creek, deep percolation of irrigation water, infiltration of septic-tank effluent, and leakage from the Verde Formation. Some inflow occurs from infiltration of precipitation that falls on the alluvium. Subsurface inflow from the alluvium along West Clear Creek is in significant amounts, although the quantity varies during the year mostly owing to variable amounts of diversion for irrigation. The largest component of inflow to the alluvium is from deep percolation of irrigation water applied to cropland adjacent to the Verde River. Most of

the water pumped for domestic use infiltrates into the alluvium through septic tanks. Inflow from the underlying Verde Formation provides enough water of a different quality to affect the quality of water in the alluvium in places where the hydraulic head in the Verde Formation is higher than in the alluvium. Each component of inflow and an estimate of the annual amount of each component is discussed in the following sections.

Inflow to the alluvium from the Verde River does not occur during base-flow conditions in the reach between measuring sites 1 and 58 (pl. 2). During the seepage investigations, no losing reaches were identified. During high flows in the river, some water flows into the alluvium as bank storage but drains back to the river after the high flows subside. High flows contain small concentrations of dissolved solids (Owen-Joyce and Bell, 1983) and probably have a dilution effect on the ground water in the alluvium immediately adjacent to the river.

Precipitation

Annual infiltration from precipitation is an estimated 2 percent of the annual precipitation or 100 acre-ft (table 2). The estimated 2 percent is an average of the total infiltration estimates of 1 to 3 percent that were determined for basins in the Southwest Alluvial Basins, Regional Aquifer-System Analysis study (T. W. Anderson, U.S. Geological Survey, Tucson, oral commun., 1982). The value is thought to be transferable to the alluvium in the southern part of the Verde Valley because of the similar climatic conditions, land-surface altitudes, and alluvial material. The combination of distribution of precipitation within a year, air temperatures, potential evaporation, and consumptive use by vegetation results in only a small quantity of water infiltrating to the water table. Almost half the annual precipitation occurs in July, August, and September when the air temperature and potential evaporation are greatest. Potential evaporation is about 70 in./yr as determined by the relation between pan evaporation and altitude developed by Anderson (1976, p. 30) or about five times the average annual precipitation. During the growing season, available precipitation is used by crops and riparian vegetation.

Tributary Inflow from West Clear Creek

West Clear Creek, the major tributary to the Verde River in the Camp Verde area, contributes an average inflow of 19 ft^3/s or 14,000 acre-ft/yr to the alluvium along the Verde River as subsurface flow because irrigation diversions between sites 42 and 51 (pl. 2) often fully deplete the surface flow at the mouth (table 2). Gains in flow in the Verde River at the mouth of West Clear Creek were used to estimate the amount of subsurface inflow to the Verde River alluvium from the West Clear Creek alluvium. A significant gain in flow was measured in the

Table 2.--Estimated average inflow to and outflow from the alluvium located downstream from the bridge south of Camp Verde in 1981

[Values, in acre-feet]

Inflow:		
Infiltration of precipitation		100
Tributary inflow from West Clear Creek		14,000
Irrigation water and septic-tank effluent:		
Irrigation water	30,000	
Septic-tank effluent return flow from alluvial pumpage	27	
Septic-tank effluent inflow from Verde pumpage	13	
Total		30,040
Verde Formation:		
Natural leakage and leakage via wells		1,000
Total inflow (rounded from 45,140)		45,100
Outflow:		
Ground-water pumpage		30
Evapotranspiration:		
Riparian vegetation	4,400	
Consumptive use by crops	4,900	
Total		9,300
Discharge to Verde River		35,800
Discharge to Verde Formation		20
Total outflow (rounded from 45,150)		45,100

Verde River between measuring sites 37 and 52 (pl. 2) during both the November 1980 and June 1981 seepage investigations. During November 1980, the measured gain was about 18 ft^3/s, of which 1.5 ft^3/s was surface flow at the mouth of West Clear Creek. On November 6, 1980, the flow at the gage 11 mi upstream from the mouth of West Clear Creek (fig. 1, site 38) was 18 ft^3/s, which is normal winter base flow. In June 1981 the measured gain was about 21 ft^3/s with no surface flow at the mouth of West Clear Creek. On June 9, 1981, the flow at the gage was 13.8 ft^3/s, which is normal summer base flow. The increase in subsurface flow is from diverted water from the Verde River that was applied to fields near the mouth of West Clear Creek. The amount of applied irrigation water was greater than evapotranspiration losses and a gain in subsurface flow at the mouth of West Clear Creek was recorded rather than a loss. Anderson (1976, p. 77) estimated the evapotranspiration losses in 1975 to be 2,400 acre-ft/yr for the entire length of West Clear Creek. Evapotranspiration is about 1,900 acre-ft/yr for the part of West Clear Creek within the study area. At the time of the summer seepage investigation, about 8 ft^3/s of subsurface irrigation return flow entered the Verde River between sites 37 and 52 (pl. 2), which was attributed mostly to West Clear Creek.

The water in West Clear Creek contains the smallest dissolved-solids concentrations in the area. During the June 1981 seepage investigation, water in the creek was sampled at the gage (fig. 1, site 38) where the dissolved-solids concentration was 198 mg/L. The water quality showed little change except between sites 48 and 49 (pl. 2) where the dissolved-solids concentration increased. At site 49, the dissolved-solids concentration was 242 mg/L, which was caused by an increase in calcium and sulfate between sites 48 and 49 (pl. 2) and correlates with the presence of gypsum (calcium sulfate) in the Verde Formation in this area. Reworked Verde Formation is contained in the alluvium deposited along West Clear Creek from tributary streams on the north side of the creek.

Irrigation Water and Septic-Tank Effluent

The major source of irrigation water for croplands and residential lawns in the study area is the Verde River (fig. 12). About six times the amount of water needed for consumptive use by crops is diverted, and this is the source of the largest component of inflow to the alluvium, although the amount of inflow varies throughout the year and is dependent on the application rate at given time periods. The amount of water diverted in 1981 was estimated to be 30,000 acre-ft (table 2) or 75 percent of the annual diversion because the ditches were not operated during 3 months in winter. The annual diversion of 40,000 acre-ft/yr was calculated by estimating the amount of water available for irrigation in the two main irrigation ditches in the area using the quantity of water diverted during the June 1981 seepage investigation (table 1, sites 9 and 11). The amount of water carried by the ditches varies and depends

EXPLANATION

LAND IRRIGATED WITH SURFACE WATER DIVERTED FROM THE VERDE RIVER—Irrigated area from aerial photographs 1977 and 1980 and updated for 1981 from field mapping; areas include crop land and residential areas with lawns

LAND IRRIGATED WITH GROUND WATER PUMPED FROM THE VERDE FORMATION—Irrigated area from aerial photographs 1977 and 1980 and updated for 1981 from field mapping

GEOLOGIC CONTACT—Dashed where approximately located. Indicates the outcrop area of the alluvium

BOUNDARY OF THE ALLUVIUM FOR CALCULATING THE WATER BUDGET WHERE THE AQUIFER IS CONTINUOUS

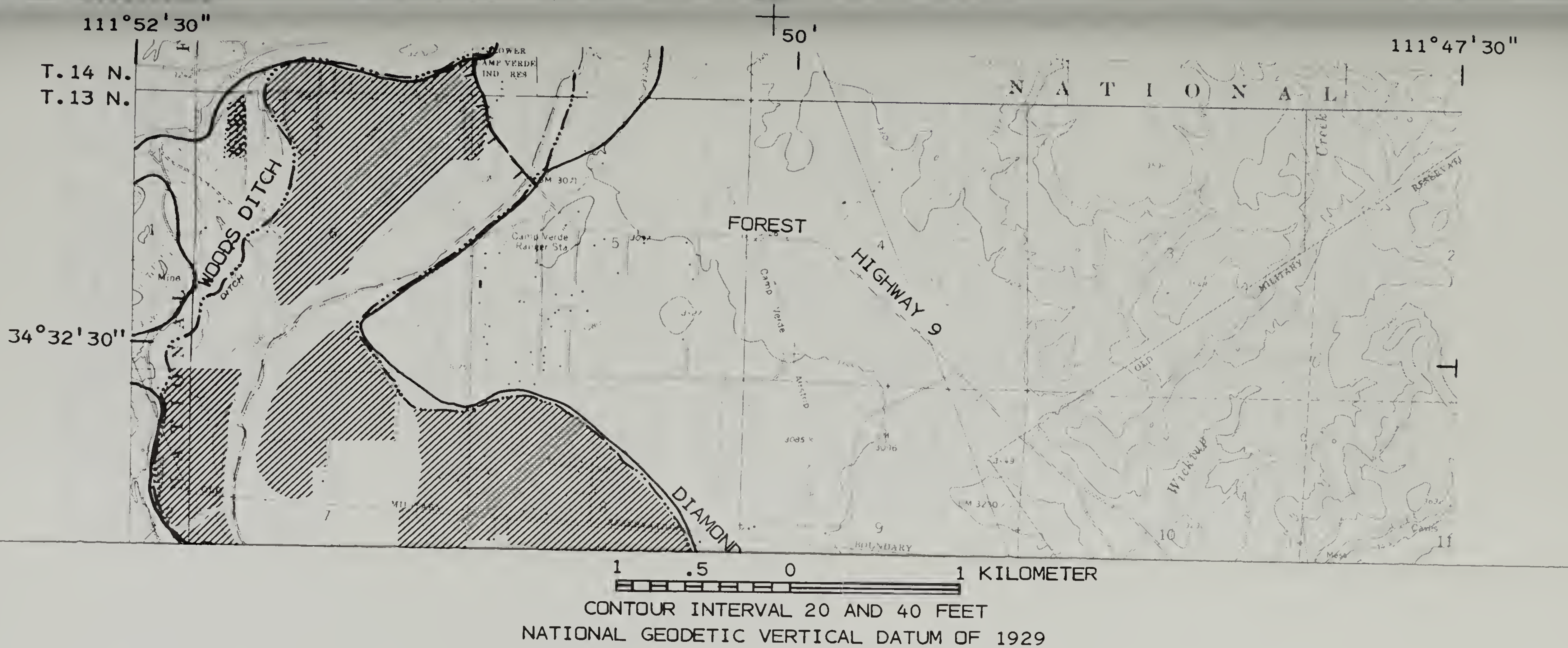


Figure 12.--Location of irrigated land on the alluvium adjacent to the Verde River south of Camp Verde, Arizona, 1981.

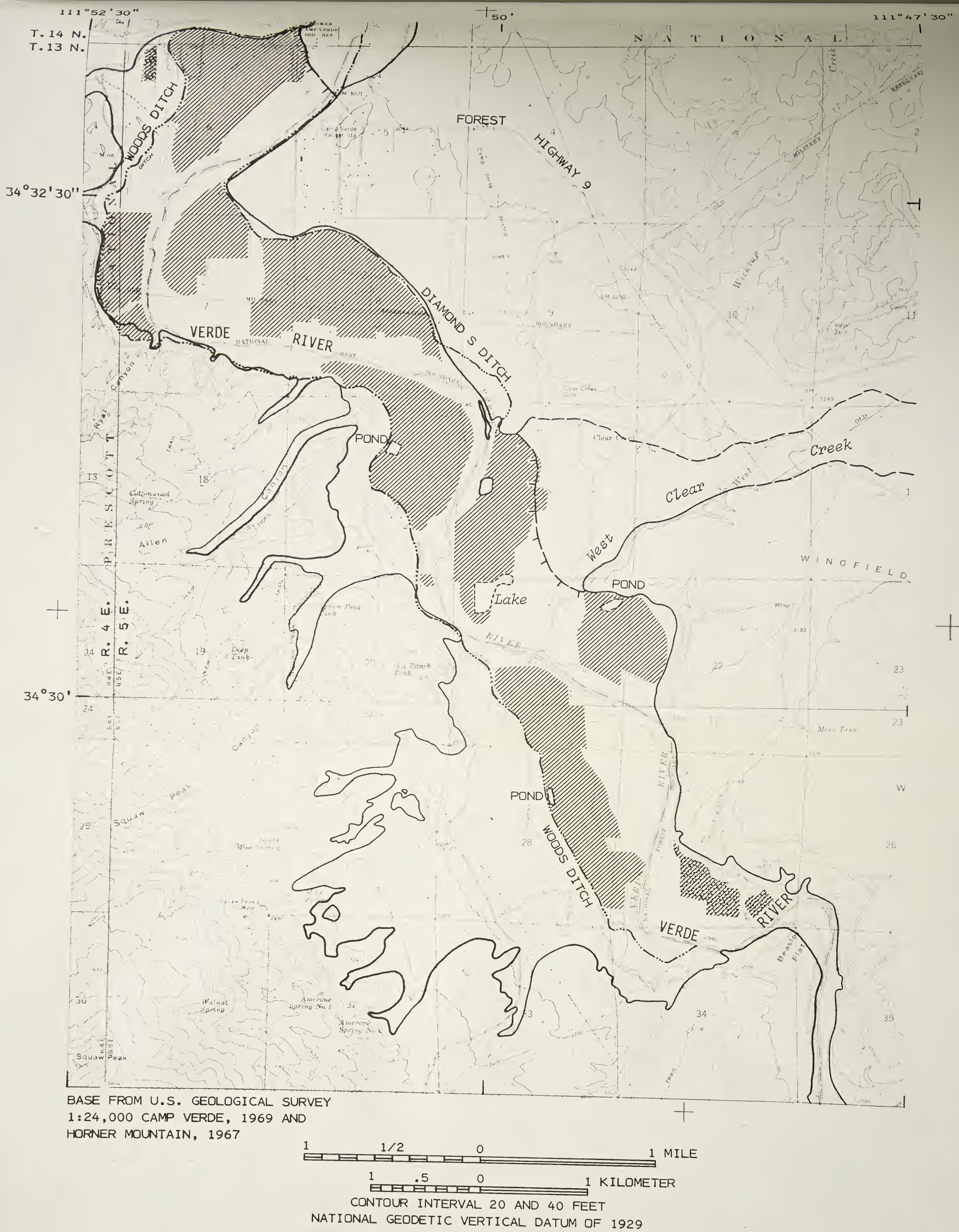


Figure 12.--Location of irrigated land on the alluvium adjacent to the Verde River south of Camp Verde, Arizona, 1981.

in part on the stage of the river at the diversion dam (table 1, sites 7 and 11). Deep percolation of canal-seepage water and irrigation water applied to cropland infiltrates to the water table, flows downgradient, and returns to the river. The large quantity of water that infiltrates to the water table flushes the aquifer and is probably the reason the alluvium is saturated in many places away from the river where the alluvium lies above the altitude of the river. An estimated 90 percent of the annual ground water pumped, 27 acre-ft, is returned to the alluvium through septic tanks (table 2). Irrigation water and septic-tank effluent inflows to the alluvium are discussed together because both can contribute similar chemical constituents to water in the alluvium.

Leakage from the main ditches, unlined lateral ditches, and ponds is considered as part of the deep percolation of water from irrigation. Diversion dams in the Verde River direct water into Woods and Diamond S ditches, and lateral ditches carry the water to the fields. The main ditches are unlined and have been in operation since the 1890's. Investigations of seepage from the ditches made by the U.S. Soil Conservation Service indicate little leakage (J. E. Alam, Flagstaff, oral commun., 1982). Approximately half of the lateral ditches are lined or piped. The lateral ditches are user operated and do not carry water throughout the irrigation season. Leakage from the unlined portions of the ditches occurs at the same time as, and therefore is included as part of, deep percolation in the fields. Leakage from ponds along the main ditches is probably small. Ten small ponds in the study area are filled with water from the main irrigation ditches. Some ponds are used to store water for later use and to maintain a head for water in the lateral ditches, and some are used for livestock watering.

Septic-tank effluent, fertilization of crops and lawns, animal wastes, decomposition of organic material in the soil, and oxidation of atmospheric nitrogen by bacteria can contribute nutrients to the ground water. Water from most wells from which water could be obtained was analyzed for nitrate, nitrite, ammonia, and orthophosphate. Septic-tank effluent also can contribute chloride and increase the dissolved-solids concentration. Deep percolation of large quantities of irrigation water generally decrease the dissolved-solids concentration in the ground water even though these waters can dissolve and carry nutrients from fertilizers and organic material in the soil, which increases the total load in the ground water.

Samples of ground water in the alluvium collected from 12 wells before and after the irrigation season show no overall trend; however, individual trends for each constituent are indicated and are dependent on local irrigation conditions. In and downgradient from areas actively irrigated, water in the alluvium showed irrigation had a dilution effect on arsenic, on ammonia, and on specific conductance, which indicates a decrease in dissolved solids (table 3). Orthophosphate generally increased after irrigation. Nitrate concentrations increased in some locations and decreased in others (table 3), which indicates that local surface conditions differ and that application of fertilizers and the location and amount of organic material decomposing are variable. Nitrate

Table 3.--Seasonal water-quality data from selected wells

[umhos, micromhos per centimeter at 25° Celsius; mg/L, milligrams per liter; ug/L, micrograms per liter; 121VERD, Verde Formation; 111ALVM, alluvium]

LOCAL IDENT- I- FIER	GEO- LOGIC UNIT	DATE OF SAMPLE	SPE- CIFIC CON- DUCT- ANCE (UMHOS)	NITRO- GEN, NO2+NO3 DIS- SOLVED (MG/L AS N)	NITRO- GEN, AMMONIA DIS- SOLVED (MG/L AS N)	PHOS- PHORUS, ORTHO, DIS- SOLVED (MG/L AS P)	ARSENIC TOTAL (UG/L AS AS)
A-13-04 12DAA	121VERD	81-03-24	--	.27	.110	--	36
	121VERD	81-10-30	3650	.13	<.060	.020	110
A-13-05 06CBA	111ALVM	81-03-24	3300	.16	.110	.030	40
	111ALVM	81-10-29	2400	.75	<.060	.080	50
A-13-05 06CCD1	111ALVM	81-03-24	--	.49	.160	.030	40
	111ALVM	81-10-29	2220	.09	<.060	.040	32
A-13-05 06CDD5	121VERD	81-03-26	3150	<.10	.240	.100	66
	121VERD	81-10-27	3150	<.09	.270	.020	57
A-13-05 06DCC1	111ALVM	81-03-24	840	1.8	.140	.030	21
	111ALVM	81-10-28	880	1.6	<.060	.050	21
A-13-05 07AAB2	121VERD	81-04-08	4200	<.10	.290	<.010	44
	121VERD	81-08-26	3850	.08	.340	.040	56
A-13-05 07ADA1	111ALVM	81-04-07	1110	1.2	.190	<.010	42
	111ALVM	81-10-28	1040	1.3	<.060	.030	39
A-13-05 07BDA1	111ALVM	81-03-23	1220	3.9	.100	.050	25
	111ALVM	81-10-28	1280	3.9	.080	.050	29
A-13-05 07DAB1	111ALVM	81-04-07	1100	1.5	.100	<.010	14
	111ALVM	81-10-28	990	.37	.080	<.010	10
A-13-05 07DAC	111ALVM	81-04-07	1130	1.6	.110	.030	20
	111ALVM	81-10-28	965	2.3	<.060	.030	12
A-13-05 07DBD1	111ALVM	81-02-24	1210	4.7	.140	.030	20
	111ALVM	81-10-28	1220	2.8	<.060	.050	23
A-13-05 08BCD1	111ALVM	81-04-08	1340	1.2	.140	<.010	48
	111ALVM	81-10-28	1300	1.1	<.060	.090	52
A-13-05 08BCD2	111ALVM	81-04-08	1430	1.1	.020	<.010	96
	111ALVM	81-10-28	1360	1.2	<.060	.040	92
A-13-05 08DBB1	121VERD	81-02-23	1310	2.0	.120	.040	120
	121VERD	81-10-28	1400	1.7	<.060	.030	110
A-13-05 17ABC2	111ALVM	81-03-25	1500	.62	.140	.040	30
	111ALVM	81-10-29	1320	.83	<.060	.050	28
A-13-05 28AAA	111ALVM	81-04-08	3600	.63	.150	<.010	10
	111ALVM	81-10-29	1280	.43	.100	.030	11

concentrations generally are less than 2.0 mg/L except east of the river in secs. 7 and 8, T. 13 N., R. 5 E., where land use is a combination of subdivided lots and croplands that input septic-tank effluent and fertilizers to the alluvium.

Ammonia is the only nutrient detected in sufficient quantities in ground-water samples to indicate the possiblility of organic pollution. Ammonia concentrations vary seasonally. In 52 percent of the samples collected, ammonia exceeds 0.1 mg/L (table 4), which generally indicates organic pollution (Goerlitz and Brown, 1972, p. 13). Most of the samples that exceeded 0.1 mg/L were collected prior to the irrigation season when septic-tank effluent has a greater effect on ground water in the alluvium. The dilution effect during irrigation drops the ammonia concentrations below the detection limit (0.06 mg/L) of the analysis (table 4). In secs. 6 and 7, T. 13 N., R. 5 E., water from some wells in the Verde Formation that underlies the alluvium contains as much as 0.34 mg/L of ammonia. Large concentrations of ammonia in water from the Verde Formation may be a contributing factor to large concentrations of ammonia in water from the alluvium where the water from the Verde Formation flows into the alluvium.

Verde Formation

The Verde Formation supplies water to the alluvium through vertical leakage and through man's activities in the area. The magnitude of the amount of vertical leakage through the formation and the leakage through wells was estimated to be 1,000 acre-ft/yr (table 2). Vertical leakage can occur where the hydraulic head in the Verde Formation is higher than the hydraulic head in the alluvium. Man's activities and associated impacts include: (1) wells drilled through the alluvium into the Verde Formation that are open to both formations where Verde heads are higher than in the alluvium allow leakage to occur, (2) domestic water pumped from the Verde Formation infiltrates into the alluvium as septic-tank effluent, and (3) irrigation water pumped from the Verde Formation infiltrates into the alluvium.

Most of the vertical leakage through the formation and leakage through wells occurs east of the river in sec. 8, T. 13 N., R. 5 E., and cannot be distinguished from each other. The quantity of inflow can vary with changes in the difference between the hydraulic heads in the alluvium and Verde Formation. Water levels in alluvial wells located in the center of N½ sec. 8, T. 13 N., R. 5 E., are affected by the artesian system because the blue clay is absent and the alluvium is deposited on limestone. In this 80-acre area, water from the Verde Formation flows into the alluvium, which increases the dissolved-solids, sulfate, and arsenic concentrations of the water in the alluvium (pl. 3). Using the range of hydraulic conductivities given in Freeze and Cherry (1979, p. 29) for limestone and dolomite, the amount of vertical leakage ranged from 0 to 1,500 acre-ft/yr.

Table 4.--Summary of nutrient data for water in the alluvium

[Analytical results in milligrams per liter except as indicated]

Constituent	Number of samples	Maximum	Minimum	Median	Contaminant level	Percentage of samples exceeding the contaminant level
Nitrate, dissolved as nitrogen......	67	6.4	0.0	1.1	[1]10.0	0
Nitrite, dissolved as nitrogen......	85	0.03	<0.01	0.01	[2]0.1-2.0	0
Ammonia, dissolved as nitrogen......	82	0.25	0.01	0.11	[3]0.1	52
Orthophosphate, dissolved as phosphorus....	86	0.27	<0.01	0.03	----	--

[1]Maximum contaminant level for public water supplies as set by U.S. Environmental Protection Agency (1977a) and Bureau of Water Quality Control (1978).

[2]Limits differ. The presence of nitrite in water is sometimes an indication of organic pollution (Goerlitz and Brown, 1972, p. 17).

[3]More than 0.1 mg/L usually indicates organic pollution (Goerlitz and Brown, 1972, p. 13).

The amount of vertical leakage from the Verde Formation into the alluvium probably is small over most of the area because the blue clay bed at the top of the Verde Formation, on which most of the alluvium was deposited, acts as a confining bed for water in the Verde Formation. The magnitude of the head differences between the alluvium and Verde Formation is evidence that the blue clay significantly restricts flow from the underlying artesian system to the alluvium. The average amount of vertical leakage is proportional to the average head difference between the alluvium and Verde Formation. During the winter when the head difference between the formations is largest and the dilution effects from irrigation are minimal, no significant change in water quality occurs to indicate the inflow of water from the Verde Formation. If the quantity of

flow were significant, inflow to the alluvium should increase with increasing head differences between the alluvium and the Verde Formation. The Verde Formation does not provide significant quantities of water to wells until the rock units underlying the blue clay are penetrated, which results in a water level that is higher than the water level in the overlying alluvium. In most of the alluvium, leakage appears to be associated chiefly with wells open to both formations. Water flows from the Verde Formation to the alluvium as a result of man's development as shown by water-quality anomalies in the alluvium (pl. 3). Verde Formation water can flow into the alluvium where wells are open to both formations and heads in the Verde Formation are higher. The number of wells that are open to both formations is unknown.

Infiltration of septic-tank effluent from residences on the alluvium that obtain their domestic water supply from the Verde Formation contributes an estimated 13 acre-ft/yr of water to the alluvium (table 2). The Verde Formation supplies water to about 240 people; 90 percent of the water flows into the alluvium through septic tanks.

Ground water is used to irrigate 77 acres on the alluvium where fields are upslope from the irrigation ditch or where no irrigation ditch is located. Annual consumptive use was estimated to be 250 acre-ft, and deep percolation of irrigation water is assumed to be negligible. Irrigation water is pumped from the Verde Formation and applied to the fields where the alluvium is dry—NW¼ sec. 6, T. 13 N., R. 5 E.—or where the saturated thickness in the alluvium is small—S½ sec. 27, T. 13 N., R. 5 E (fig. 12). Where the alluvium remains dry, little or no water is infiltrating from irrigation and remaining in the alluvium. Sprinkler-system irrigation rather than flood irrigation is used in sec. 27. During the summer irrigation season, no major gain in flow to the river was detected between measuring sites 53 and 56 (pl. 2).

Ground water from the Verde Formation contains large concentrations of dissolved solids, sulfate, chloride, arsenic, fluoride, boron, and some minor elements; some of these constituents exceed the maximum contaminant levels for public water supplies (table 5). The quality differs throughout the formation owing to the different rock units that were deposited; therefore, the quality of water that flows into the alluvium from the Verde Formation is dependent on location. A limestone bed provides water to well (A-13-5)6aaa in which the major ions are magnesium, calcium, and bicarbonate; the dissolved-solids concentration is 559 mg/L. The sandstone and conglomerate beds in sec. 27, T. 13 N., R. 5 E., produce water with dissolved-solids concentrations that range from 695 to 898 mg/L; the major ions are magnesium, calcium, bicarbonate, and sulfate. Throughout most of the area, mudstone and claystone beds that contain differing amounts of evaporites predominate; in places, beds of gypsum have been encountered. Dissolved-solids concentrations range from 1,020 to 2,590 mg/L, and different combinations of major ions are found. Sodium, sulfate, and chloride are the major ions in water from wells in secs. 6 and 7, T. 13 N., R. 5 E.; calcium and sulfate are the major ions in water from wells in sec. 16, T. 13 N., R. 5 E. Magnesium, sodium, calcium, sulfate, and bicarbonate are the major ions

Table 5.--Summary of quality of water in the Verde Formation near and underlying the alluvium

[Analytical results in milligrams per liter except as indicated]

Constituent	Number of samples	Maximum	Minimum	Median	Contaminant level	Percentage of samples exceeding the contaminant level
Sulfate, dissolved........	32	[1]2,900	78	550	[2]250	84
Chloride, dissolved........	33	[1]3,035	11	60	[2]250	21
Fluoride, dissolved........	25	4.0	0.1	0.7	[3]1.4	40
Sum of constituents, dissolved........	23	2,590	491	1,310	[2]500	96
Nitrate, dissolved as nitrogen......	32	2.0	0	0.13	[3]10	0
Nitrite, dissolved as nitrogen......	42	.03	<.01	.01	[4]0.1-2.0	0
Ammonia, dissolved as nitrogen.....	41	.55	<.06	0.16	[5]0.1	71
Orthophosphate, dissolved as phosphorous...	47	.14	<.01	.02	--------	--
Arsenic, total, in micrograms per liter.....	45	210	2	60	[3]50	58

See footnotes at end of table.

Table 5.--Summary of quality of water in the Verde Formation near and underlying the alluvium--Continued

Constituent	Number of samples	Maximum	Minimum	Median	Contaminant level	Percentage of samples exceeding the contaminant level
Boron, dissolved, in micrograms per liter.....	23	1,700	1	380	[6]750	30
Iron, dissolved, in micrograms per liter.....	24	15,000	<10	36	[2]300	17
Lead, dissolved, in micrograms per liter.....	8	58	1	10.5	[3]50	12
Manganese, dissolved, in micrograms per liter.....	22	360	<1	10	[2]50	4

[1]Analyses for sum of constituents were not obtained for all samples.

[2]Maximum contaminant level for public water supplies as set by U.S. Environmental Protection Agency (1977b).

[3]Maximum contaminant level for public water supplies as set by U.S. Environmental Protection Agency (1977a) and Bureau of Water Quality Control (1978).

[4]Limits differ. The presence of nitrite in water is sometimes an indication of organic pollution (Goerlitz and Brown, 1972, p. 17).

[5]More than 0.1 mg/L usually indicates organic pollution (Goerlitz and Brown, 1972, p. 13).

[6]Maximum contaminant level for boron applicable to water used for long-term irrigation on sensitive crops (U.S. Environmental Protection Agency, 1977c).

in water from wells in secs. 8 and 17, T. 13 N., R. 5 E. Sulfate, chloride, and boron are characteristic of evaporites deposited in closed basins, and fluoride is deposited in evaporite sediments (Rankama and Sahama, 1950). Arsenic is associated with clays in the Verde Formation (Owen-Joyce and Bell, 1983, p. 28). In some water samples from wells in the SE¼ sec. 6 and NE¼ sec. 7, T. 13 N., R. 5 E., the maximum contaminant levels for iron and manganese are exceeded. The large concentrations of iron and manganese probably are caused by a local depositional condition in the Verde Formation.

Outflow from the Alluvium

Outflow from the alluvium occurs as ground-water pumpage, evapotranspiration, discharge to the Verde River, and discharge to the Verde Formation. Pumpage accounts for a small amount of discharge. Water is discharged by direct evaporation and transpiration by riparian vegetation and crops. The largest amount of outflow from the alluvium is discharge to the Verde River and is a seasonal occurrence related to irrigation. Some ground water in the alluvium is discharged to the Verde Formation where the hydraulic head in the Verde Formation is lower than in the alluvium.

Ground-Water Pumpage

The annual ground-water pumpage from the alluvium was estimated to be 30 acre-ft (table 2) and was obtained using a count of housing units, a ratio of residents per housing unit, and water-use figures per person estimated from cities where water use is monitored. The count of housing units was taken from 1980 aerial photographs and 1981 field data. Population and housing figures from the 1980 census provided a ratio of two persons per housing unit for this area of Arizona. The alluvium supplies water to an estimated 420 people. A count of housing units on the alluvium was adjusted because not all the units obtain water from the alluvium. Where the alluvium is dry or does not contain enough saturated thickness to provide a domestic water supply, water is obtained from the underlying Verde Formation. Wells open to both the alluvium and Verde Formation were counted as alluvial wells in order to account for all wells that obtain water from the alluvium. Housing units in areas where the water source is unknown and mapped data and drillers' logs indicate that the alluvium could supply sufficient water were considered supplied by alluvial wells. Per capita water use was estimated to be 100 gal/d or 0.07 acre-ft/yr and allows for the use of surface water for irrigation of lawns and small gardens.

Irrigation wells drilled in the alluvium were not a source of irrigation pumpage during the time of the study. The irrigation wells were drilled to supplement surface water during drier years.

Ground water from most of the alluvium exceeds the maximum contaminant level for dissolved solids in public water supplies and may exceed the maximum contaminant levels for sulfate, chloride, arsenic, and some minor elements. The maximum contaminant level for dissolved solids in public water supplies is 500 mg/L, as proposed in the secondary drinking-water regulations of the U.S. Environmental Protection Agency (1977b, p. 17146). Water that contains a larger dissolved-solids concentration is used when it is the only available water. Dissolved-solids concentrations in water from the alluvium range from 251 to 4,400 mg/L (table 6); most of the water contains between 500 and 1,000 mg/L of dissolved solids (pl. 3).

Three main factors control water quality in the alluvium: (1) the amount and quality of the applied irrigation water, (2) the composition of the materials in the alluvium, and (3) the amount and quality of inflow from the underlying Verde Formation. Differences occur because the factors or combination of factors differ throughout the study area. The major ions in water from the alluvium are magnesium, calcium, sodium, and bicarbonate, which correlates with the major ions in the river water used for irrigation. The dissolved-solids concentration, however, is larger in water from the alluvium than in the river water.

In secs. 6 and 7, T. 13 N., R. 5 E., on the west side of the river, the major ions are sodium, magnesium, and sulfate. The alluvium on the west side of the river contains reworked Verde Formation, and the Verde Formation upslope from secs. 6 and 7 contains sodium sulfate and some sodium chloride salts. Water from the Verde Formation does not flow into the alluvium in this area because the hydraulic head in the Verde Formation is lower than in the alluvium. In sec. 28, T. 13 N., R. 5 E., the alluvium contains silt and clay that are probably reworked Verde Formation.

On the east side of the river in sec. 8, T. 13 N., R 5 E., the major ions are sodium, magnesium, calcium, bicarbonate, and sulfate, which reflect a mixing of the water from the alluvium and the Verde Formation. The largest arsenic concentrations in the alluvium occur in this area, which indicate inflow from the Verde Formation (pl. 3). Downgradient from West Clear Creek in sec. 21, T. 13 N., R. 5 E., water in the alluvium is diluted by water from West Clear Creek, which contains the smallest dissolved-solids concentrations in the study area.

Sulfate and chloride contribute to the large dissolved-solids concentrations. In some wells, sulfate and chloride exceed the maximum contaminant level of 250 mg/L (U.S. Environmental Protection Agency, 1977b, p. 17146). Sulfate concentrations range from 32 to 2,300 mg/L (table 6); in most of the alluvium, the sulfate concentration is less than 250 mg/L (pl. 3). Sulfate exceeds 250 mg/L on the west side of the river in secs. 6 and 7, T. 13 N., R. 5 E., and in individual wells scattered throughout the area where wells are open to the alluvium and Verde Formation or where wells are located downgradient from wells with mixed waters. Chloride concentrations range from 3.9 to 1,500 mg/L

Table 6.--Summary of quality of water in the alluvium

[Analytical results in milligrams per liter except as indicated]

Constituent	Number of samples	Maximum	Minimum	Median	Contaminant level	Percentage of samples exceeding the contaminant level
Sulfate, dissolved........	46	2,300	32	165	[1]250	30
Chloride, dissolved........	47	1,500	3.9	36	[2]250	9
Fluoride, dissolved........	32	1.5	0.1	0.4	[2]1.4	3
Sum of constituents, dissolved........	27	4,400	251	712	[1]500	85
Arsenic, total, in micrograms per liter.....	89	220	3	22	[2]50	18
Boron, dissolved, in micrograms per liter.....	25	1,900	20	310	[3]750	20
Iron, dissolved, in micrograms per liter.....	24	1,100	<10	29.5	[1]300	8
Manganese, dissolved, in micrograms per liter.....	22	70	<1	7.5	[1]50	5
Selenium, dissolved, in micrograms per liter.....	7	16	2	7	[2]10	14

[1]Maximum contaminant level for public water supplies as set by U.S. Environmental Protection Agency (1977b).

[2]Maximum contaminant level for public water supplies as set by U.S. Environmental Protection Agency (1977a) and Bureau of Water Quality Control (1978).

[3]Maximum contaminant level for boron applicable to water used for long-term irrigation on sensitive crops (U.S. Environmental Protection Agency, 1977c).

(table 6). In most of the alluvium, except in secs. 6 and 7, T. 13 N., R. 5 E., on the west side of the river, chloride concentrations are less than 250 mg/L (pl. 3). Well (A-13-5)21dcd2 contains the largest concentration of chloride—1,500 mg/L—and is probably open to both the alluvium and Verde Formation. The bottom of the well is 15 ft below the top of the clay unit in the Verde Formation. The static water level is 2 ft higher than where water was first encountered during drilling, which implies the presence of an underlying artesian system. The major ions in water from this well are sodium and chloride. Sodium chloride salt deposits are localized in the Verde Formation and this well probably taps water from one of these deposits.

Arsenic, fluoride, iron, manganese, and selenium in drinking water and boron in water used for long-term irrigation on sensitive crops (table 6) exceed the maximum contaminant levels set by the U.S. Environmental Protection Agency (1977c) and the State of Arizona (Bureau of Water Quality Control, 1978). Concentrations of these constituents that exceed the maximum contaminant levels, except for arsenic, occur in water from wells scattered throughout the area where wells are open to both the alluvium and Verde Formation or where reworked Verde is contained in the alluvium. Large concentrations of arsenic are found mostly in water from the alluvium east of the river in sec. 8, T. 13 N., R. 5 E.; the source of the arsenic is inflow from the Verde Formation (pl. 3).

Evapotranspiration

The total annual estimated evapotranspiration is 9,300 acre-ft (table 2) and occurs from many sources in the study area. Riparian vegetation and crops transpire water. Water evaporates from open-water surfaces in the river, ditches, laterals, ponds, and bare-soil surfaces near the river where the depth to water is less than 10 ft. Changes in water quality owing to evapotranspiration are masked by the large quantities of irrigation water moving through the alluvium.

Along the Verde River between the bridge near site 14 and site 58 (pl. 2), about 1,100 acres of riparian vegetation—primarily mesquite, cottonwood, and riparian scrub—use an estimated 3,200 acre-ft of water annually; average consumptive use by riparian vegetation therefore is about 3 acre-ft/acre. Phreatophytes along the river, on bottom land along wash channels, and along irrigation ditches obtain water from the alluvium. Transpiration by riparian vegetation was calculated using the unpublished data summarized in a study by Anderson (1976) and was applied to this budget-study area. Acreage, annual water use by the different types of riparian vegetation, and method of calculation were from Anderson (1976). The depth to water was determined during this study. Water evaporating from the surface of 13.9 mi of river, which averages 100 ft wide, is an estimated 1,000 acre-ft/yr; therefore, the

total annual evapotranspiration is 4,200 acre-ft for this reach of the Verde River.

An estimated 180 acre-ft/yr was lost to evaporation from the water surface in the main ditches, lateral ditches, and ponds. Diamond S ditch and half the length of Woods ditch lie in the study area and total about 70,000 ft. The main ditches average 8 ft wide and flow about 9 months of the year. The assumption was made that half the lateral ditches off Woods ditch lie in the study area; therefore, about 98,000 ft of laterals branch off from both main ditches. The lateral ditches average about 2 ft wide and probably were used twice a week for 9 months of the year. Evaporation from the main and lateral ditches was estimated to be 60 acre-ft/yr. Evaporation was 120 acre-ft/yr from approximately 20 acres of ponds along the irrigation ditches.

About 1,220 acres of cropland on the alluvium is irrigated by surface water diverted or pumped from the Verde River, and the annual consumptive use is estimated to be 4,900 acre-ft (table 2). Irrigated acreage was determined from aerial photographs taken in 1977 and 1980. The amount of water used per acre depends on soil type, crop type, and methods of irrigation, which are described in the Verde Valley Water Pollution Source Analysis (Northern Arizona Council of Governments, 1979, p. 123-126). Consumptive water use in the Verde Valley was estimated to be 4 acre-ft/acre, and a realistic value for infiltration in the study area is 1 in./hr with little evaporation from the fields (J. E. Alam, U.S. Soil Conservation Service, Flagstaff, oral commun., 1982).

Studies in other areas in Arizona have reported that evapotranspiration is a potential cause of water-quality changes in ground water and surface water. The effects on water quality known to be caused by evapotranspiration in these studies were investigated in the Camp Verde area. The effect that evapotranspiration has on water quality depends on climate, type of vegetation, and amount and type of irrigation methods used in an area. Evapotranspiration as a result of crop and riparian vegetation water use tends to increase the dissolved-solids concentration in an interconnected ground- and surface-water system without increasing total loads of dissolved solids (Gatewood and others, 1950, p. 78-79). Change in ground-water quality owing only to evapotranspiration is indicated by equally increased ionic concentrations in infiltrated water compared to the applied water and is indicated by unchanged or nearly unchanged sodium percentage, which depends on the ratio of sodium concentration to total cation concentration (Olmsted and others, 1973, p. 126).

Evapotranspiration causes little or no detectable change in ground-water quality in the alluvium or surface-water quality in the Verde River. Seasonal sampling of specific conductance in selected wells does not indicate an increase in dissolved solids during the summer when evapotranspiration is greatest. Specific-conductance changes were small,

and wells near the river actually showed a decrease in specific conductance during the summer (table 3), which implies dilution rather than concentration of dissolved solids. In comparison to the data from the November seepage investigation, the total loads of dissolved solids and the percentage of sodium in the surface water increased during June; therefore, more than evapotranspiration is causing the increased dissolved-solids concentrations. Water is diverted upstream from where the dissolved-solids concentration increases in the river; therefore, the water applied to the fields generally contains less than 500 mg/L of dissolved solids and the major ions are calcium, magnesium, sodium, and bicarbonate. Water is removed from the area by evapotranspiration and the soluble matter originally in the water is left behind, which can cause an accumulation of salts in the soil at the land surface. The salts are dissolved later by precipitation or irrigation water and transported to the aquifer. Salt accumulation from evapotranspiration does not appear to be a problem in this area during irrigation. Large quantities of diverted river water that are applied to the fields minimize the deposition of salts in the soils and mask any water-quality changes by evapotranspiration to ground water that is in the aquifer or that discharges to the river.

Discharge to the Verde River

Data from seepage investigations limited to periods of base flow were used to define the sources of significant gains to the Verde River: (1) subsurface flow from West Clear Creek and (2) irrigation subsurface return flows. The quantities of discharge to the river are variable and the measurements are representative of base flow and irrigation for the conditions that existed at the time of the individual investigations. Data from a 1979 seepage investigation indicated the study reach exhibited gains in streamflow (Owen-Joyce and Bell, 1983, p. 36). Springs and the shape of the water table, as illustrated by the contour lines in the alluvium (pl. 2), show ground-water movement toward the river. Water-quality changes in the river also indicate ground-water discharge to the river. Subsurface return flows from irrigation dissolve soluble minerals in the alluvium and contribute to water-quality changes in the river.

West Clear Creek supplies the single largest point source of discharge from the alluvium to the Verde River—an estimated 14,000 acre-ft/yr. During June 1981, all the water coming from West Clear Creek that discharged to the Verde River arrived as subsurface flow through the West Clear Creek alluvium deposited at the mouth of the creek. In November 1980, some of the discharge did appear as surface flow at the mouth of the creek. In the lower parts of some of the channels cut in the West Clear Creek alluvium, water flowed for short distances on the alluvium and some ground water seeped to flow as surface water the last 200 ft to the Verde River. The source of most of the gain to the Verde River in November was also subsurface flow, and the surface flow near the mouth of West Clear Creek was probably caused

by the higher stage of the Verde River at this time of year. Water-quality changes between sites 37 and 52 (pl. 2) support the concept that subsurface flow in the West Clear Creek alluvium is the source of inflow in this reach. The major ions in water in West Clear Creek are calcium, magnesium, and bicarbonate, and the dissolved-solids concentration was 242 mg/L at site 49 in June of 1981 (pl. 2). During June 1981, a decrease in the dissolved-solids concentration (fig. 13), an increase in the calcium concentration, and a decrease in sodium concentration (fig. 14) were recorded between sites 37 and 52. The concentration of other constituents in the Verde River changed little if at all owing to the inflow.

An estimated 21,800 acre-ft/yr or about 70 percent of the water diverted from the river returns as ground-water discharge from the alluvium. The gains in flow in the river are essentially water from the Verde River rerouted through the irrigation ditches and the alluvium and discharged as ground water from the alluvium farther downstream. The estimate of ground-water discharge was calculated by balancing the water budget. Evaluation of the seepage-investigation data showed the variations in ground-water discharge to the river. Total ground-water discharge was calculated from the difference between flows in the river at measuring sites 14 and 58 in June 1981 (table 1, pl. 2) and accounting for diversions, return flows, and tributaries. The resultant gain in flow was compared to the difference between the amount of water applied to the fields and that consumed by crops. The gain in flow was within 1 ft^3/s of the amount of water not used by crops. The same analysis applied to data from the June 1979 seepage investigation also yielded an agreement in these quantities within 1 ft^3/s.

Water quality in the river is closely associated with the gains in flow that occur in the study reach. The amount of gain and the quality of the water that seeps to the river are reflected in the changes in ionic concentrations in the river. The variations in amounts and locations of irrigation in the area can cause variations in water chemistry at each site; therefore, the water-quality data during the seepage investigations are also indicative of conditions existing at the time. Trends do appear to be consistent between November and June; therefore, quantities probably change but the relation between sites follows a trend throughout the year.

During base-flow conditions, the dissolved-solids concentrations of water in the Verde River vary throughout the year. During November 1980, dissolved-solids concentrations ranged from 357 to 462 mg/L; whereas during June 1981, the concentrations ranged from 460 to 614 mg/L (fig. 13). Dissolved-solids concentrations increased downstream and followed a rather smooth curve during November; a small fluctuation occurred downstream from site 25 (pl. 2) where the springs are located. During June, the dissolved-solids concentrations in the river fluctuate more because of irrigation return flows. Return flows differ in composition and dissolved solids, which depend on where the irrigation water was taken from the river and the composition of the material the water flows

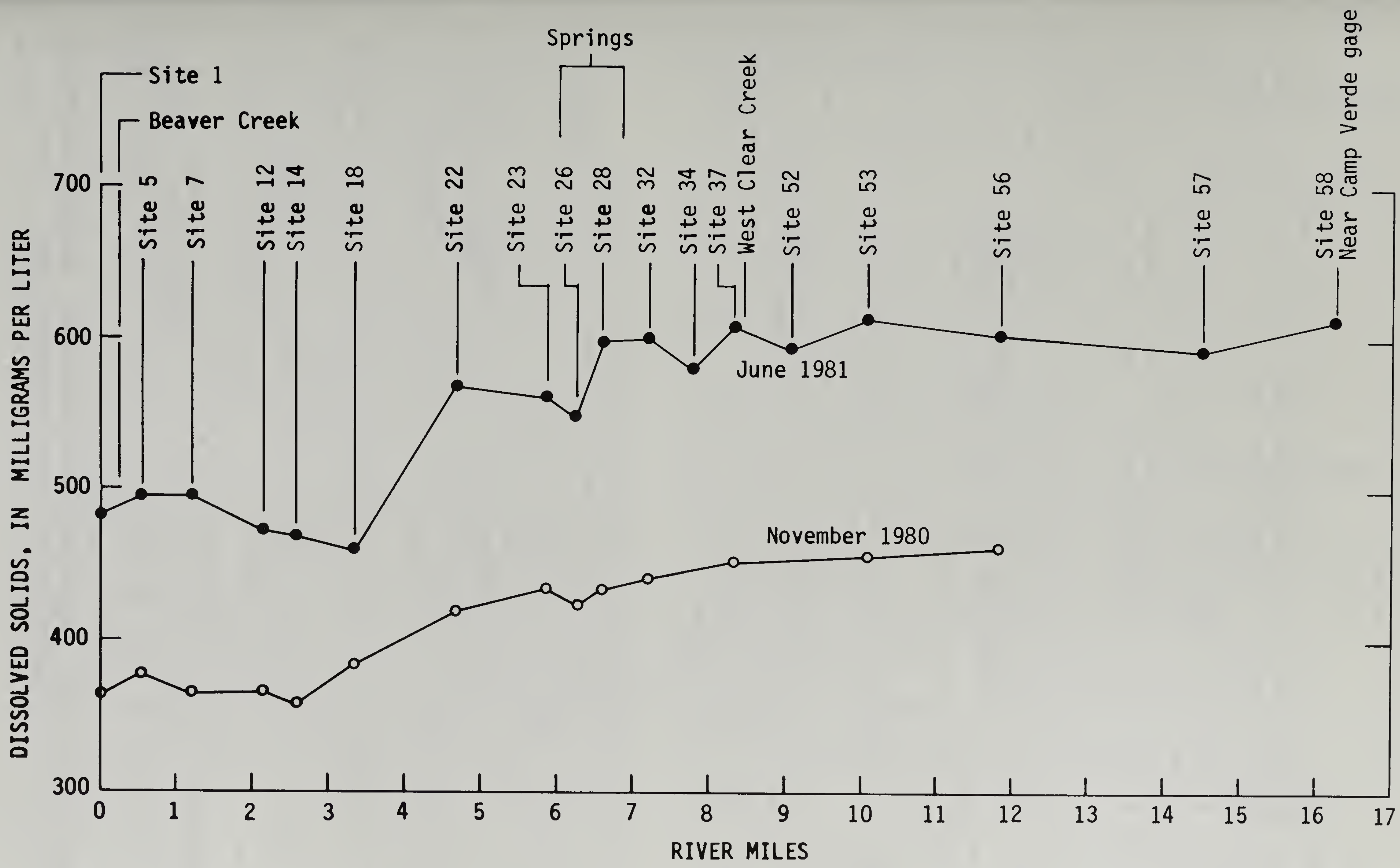


Figure 13.--Dissolved-solids concentrations along the Verde River.

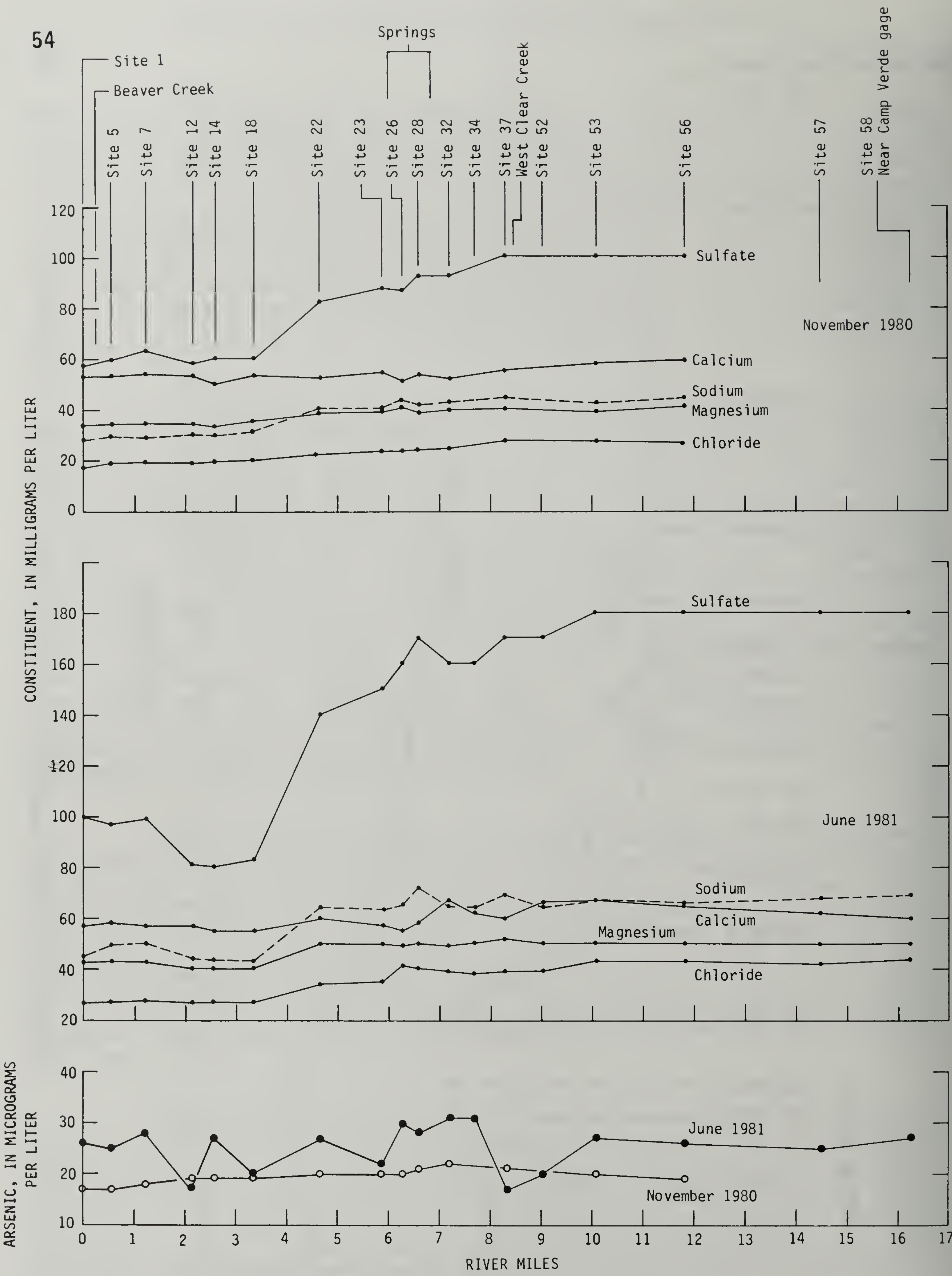


Figure 14.--Calcium, magnesium, sodium, chloride, sulfate, and arsenic concentrations along the Verde River.

through. Water diverted into Woods ditch originates outside the study area in the Verde River upstream from Beaver Creek and in June had a dissolved-solids concentration of 366 mg/L. Diamond S ditch originates upstream from site 14 (pl. 2) and probably would have had a dissolved-solids concentration similar to the river water at site 14, which was 469 mg/L. The alluvium along the west side of the river and away from the river channel contains more reworked Verde Formation than the alluvium on the east side. Subsurface return flows from water used to irrigate lands downslope from the salt mine in secs. 6 and 7, T. 13 N., R. 5 E., and sec. 12, T. 13 N., R. 4 E., contain larger concentrations of sodium and sulfate. These two constituents show a marked increase in the river between sites 18 and 22 (fig. 14), and therefore dissolved-solids concentrations increase (fig. 13). Because the hydraulic head in the Verde Formation is higher than the river level during base flows in this reach and the Verde Formation crops out in the river near site 14, some of the increase in dissolved-solids, sodium, and sulfate concentrations may be the result of inflow from the Verde Formation. During the lower flows in June, arsenic concentrations increase in this reach (fig. 14). Arsenic concentrations in water from wells in the Verde Formation on the east side of the river near site 14 range from 90 to 160 µg/L. The sodium sulfate salts from the salt mine on the west side of the river contain small amounts of arsenic, but if sufficient quantities of clay from the Verde Formation are present in the alluvium, arsenic could be supplied from the clay. Water in the alluvium on the west side of the river does contain larger concentrations of arsenic than that on the east side.

Changes in the dissolved-solids concentrations in the river from one sampling site to another correlate with changes in the sulfate and sodium concentrations. In November 1980, the changes from site to site are not as pronounced because flows in the river are higher and subsurface return flows are lower than in June 1981 (figs. 13 and 14). Irrigation contributes to the water-quality changes in the river by providing the water to dissolve the soluble minerals in the alluvium as the water percolates to the water table and ultimately to the river; therefore, the changes are larger during irrigation. Part of the increase in dissolved solids is contributed by inflow from the Verde Formation to the alluvium, which is diluted by irrigation water and travels to the river through the alluvium. Although irrigation is at a minimum in November, the concentrations of sulfate and sodium still increase at sites in the river. November conditions are a closer indication of the water-quality changes that result from inflow from the Verde Formation.

Natural discharge from the alluvium is probably masked by the irrigation return flows. It is unknown if the springs issuing from the alluvium were present before the installation of the irrigation ditches. In 1981, springs issued from the alluvium in secs. 8 and 16, T. 13 N., R. 5 E. (pl. 2). Most springs seem to be perennial, although some are underwater during high flows in the river. The springs in sec. 8, T. 13 N., R. 5 E., issue from the alluvium along the banks of the river; whereas most springs in sec. 16, T. 13 N., R. 5 E., issue from the

alluvium above the alluvium-Verde Formation contact exposed on the east bank of the river. Altitudes of the springs conform to the alluvial water-table contour lines. Water quality of two springs, (A-13-5)8dcd and (A-13-5)16bcd, also indicates that the alluvium is the source of water. The dissolved-solids concentrations range from 461 to 594 mg/L, sulfate concentrations range from 100 to 160 mg/L, and arsenic concentrations range from 18 to 23 µg/L.

Water quality and altitude of three springs—(A-13-5)8dbb, (A-13-5)16baa2, and (A-13-5)16bbd1—indicate the presence of discharge from the Verde Formation, but the total quantity of water discharging is masked by the subsurface irrigation return flows. Changes in the concentrations of cations, anions, dissolved solids, and arsenic in the river near these springs indicate the inflow of some water that contains the larger concentrations of sulfate, sodium, magnesium, dissolved solids, and arsenic (figs. 13 and 14) known to be present in Verde Formation water. Blue Spring, (A-13-5)16bba2, flows an estimated 350 acre-ft/yr. Depending on the location of the sampling site within Blue Spring's pool, the dissolved-solids concentrations range from 491 to 954 mg/L, sulfate concentrations range from 110 to 420 mg/L, and arsenic concentrations range from 34 to 48 µg/L. The large range in values indicates a probable mixing of waters from both the alluvium and Verde Formation that discharge at this site.

Potential Discharge to the Verde Formation

The potential for water to flow from the alluvium into the underlying Verde Formation exists where the hydraulic head in the Verde Formation is lower than the hydraulic head in the alluvium; the estimated outflow is 20 acre-ft/yr (table 2). This head relation occurs along the west side of the alluvium in secs. 6, 7, and 17, T. 13 N., R. 5 E., and in the southern part of the study area in secs. 21, 27, 28, 33, and 34, T. 13 N., R. 5 E. (pl. 2). In secs. 6, 7, 17, 21, and 28, discharge from the alluvium is negligible because in the N½ sec. 6, SW. cor. sec. 21, and W½ sec. 28, most of the alluvium is dry. In secs. 7 and 17, the S½ sec. 6, W¼ sec. 27, and E½ sec. 28, the alluvium is deposited on the blue clay of the Verde Formation, which acts as a perching bed. In sec. 33 and the south-central part of sec. 27, the blue clay no longer underlies the alluvium and the Verde Formation is composed of sandstone and conglomerate, which is coarse-grained material with higher permeabilities. Where water in the alluvium is perched on the blue clay and wells are open to both formations, water cascades from the alluvium to the Verde Formation. In addition to leakage through wells, natural leakage probably occurs in this area but at a slower rate. The saturated thickness of the alluvium in the areas of cascading water is less than 5 ft. Most of the outflow probably occurs as cascading water in five wells, the total outflow was estimated using an assumed flow rate of 2 to 3 gal/min per well.

SUMMARY

To aid in understanding the hydrologic system, part of the Camp Verde area—south of Camp Verde—was selected to study the interconnection of the three water sources and the effects of the interconnection on water in the alluvium. Sources and uses of water in the Camp Verde area are: (1) water diverted from the Verde River and its tributaries is used to irrigate fields on the alluvium, (2) water pumped from the alluvium provides a domestic water supply, and (3) water in the Verde Formation provides domestic and public water supplies where the alluvium is absent or does not provide sufficient quantities of water. Water quality differs depending on the source.

A perennial river and an interrupted tributary, a water-table aquifer in the alluvium along the river, irrigation on the alluvium, and an underlying artesian aquifer in the Verde Formation interact to create a dynamic hydrologic system south of Camp Verde. A water budget was used to estimate the quantities of the inflow and outflow components. Water quality in the alluvium varies because differences exist in the material making up the alluvium and in the main inflow and outflow components functioning in local areas.

The water-bearing alluvium—mainly the channel, flood-plain, and terrace deposits of the Verde River—is hydraulically connected to the river. This unconfined ground-water system is in dynamic equilibrium. The largest component of inflow to the alluvium—an estimated 30,000 acre-ft/yr—is deep percolation of irrigation water. The Verde River functions as a drain. The quantity of water that discharges to the river is proportional to the amount of irrigation water applied at a given time. Generally the alluvium is less than 60 ft thick; as much as 30 ft is saturated. Saturated thickness varies owing to irrigation and mounding of the water table. The amount of water stored in the alluvium is estimated to be 17,500 acre-ft. West Clear Creek contributes 14,000 acre-ft/yr of subsurface flow, which passes through the alluvium to discharge to the river. Inflow from the Verde Formation is 1,000 acre-ft/yr. Outflow is mainly discharge to the Verde River that consists of irrigation return flows and West Clear Creek subsurface flows—estimated to be 35,800 acre-ft/yr—and evapotranspiration by riparian vegetation and crops—estimated to be 9,300 acre-ft/yr. Precipitation, discharge to the Verde Formation, and domestic pumpage, most of which returns through septic tanks, are less than 1 percent of the budget.

The alluvium is hydraulically connected to the underlying Verde Formation and the hydraulic head in the Verde Formation is as much as 10 ft higher than the hydraulic head in the alluvium in some wells. Leakage to the alluvium occurs through the formation and through wells open to both formations mainly in secs. 7 and 8, T. 13 N., R. 5 E. Along the west side of the alluvial outcrop and mainly in parts of

secs. 27, 28, and 34, the hydraulic head in the Verde Formation is as much as 50 ft lower than the hydraulic head in the alluvium. Saturated thickness in the alluvium generally is less than 5 ft, and water cascades in some wells that are open to both formations. In places the alluvium is dry. Ground water in the Verde Formation drains to the Verde Fault zone; however, some leakage to the river may occur where the Verde Formation crops out in the river bed and the hydraulic head in the Verde Formation is higher than river level.

Water quality in the alluvium is affected by (1) the quantity and quality of irrigation water, (2) the composition of the materials in the alluvium, (3) inflow from the Verde Formation, (4) inflow from West Clear Creek, and (5) inflow of septic-tank effluent. During the irrigation season, deep percolation of water causes a dilution effect on water in the alluvium. Water moves slowly through the alluvium and dissolves minerals from rocks and soils; the dissolved-solids and sulfate concentrations increase where evaporite minerals from reworked Verde Formation are present. Locally, inflow of water from the Verde Formation increases the dissolved-solids, sulfate, chloride, and arsenic concentrations in the alluvium. Near the mouth of West Clear Creek, inflow from West Clear Creek dilutes ground water in the alluvium. Water-quality changes owing to inflow of septic-tank effluent appear to be seasonal; ammonia concentrations exceed 0.1 mg/L during the winter, which indicates the possibility of organic pollution before dilution by the irrigation water in summer. Evapotranspiration causes little or no detectable change in ground-water or surface-water quality but any changes in water quality may be masked by large quantities of infiltrating irrigation water. Dissolved-solids concentrations in the alluvium range from 251 mg/L near West Clear Creek to 4,400 mg/L where evaporite minerals from the Verde Formation are present in the alluvium. Sulfate, chloride, fluoride, arsenic, boron, iron, manganese, and selenium can exceed the maximum contaminant levels for public water supplies, and large concentrations are associated mostly with material from the Verde Formation in the alluvium or inflow from the Verde Formation.

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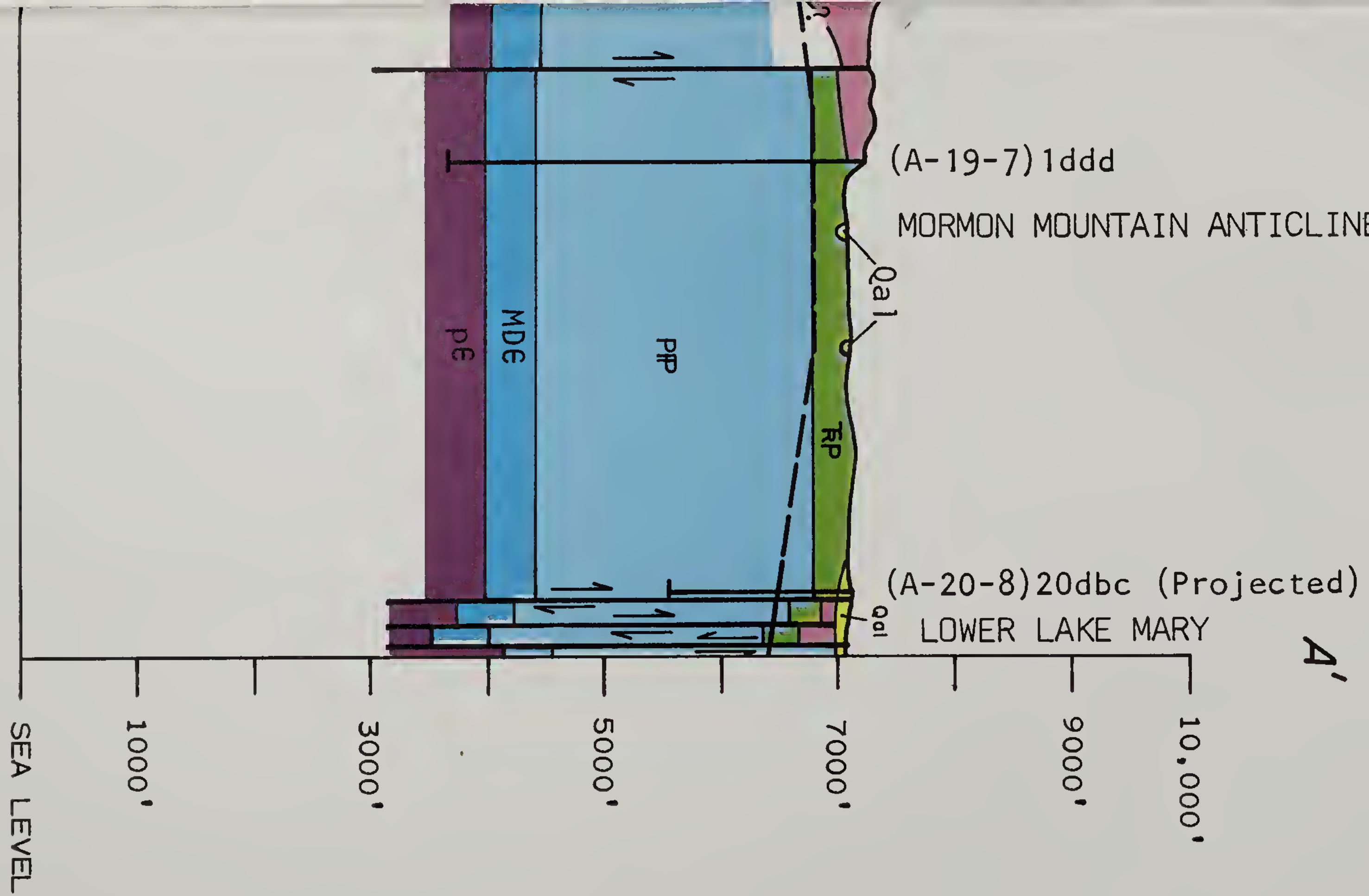

BULLETIN 2
PLATE 1

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Arizona: U.S.
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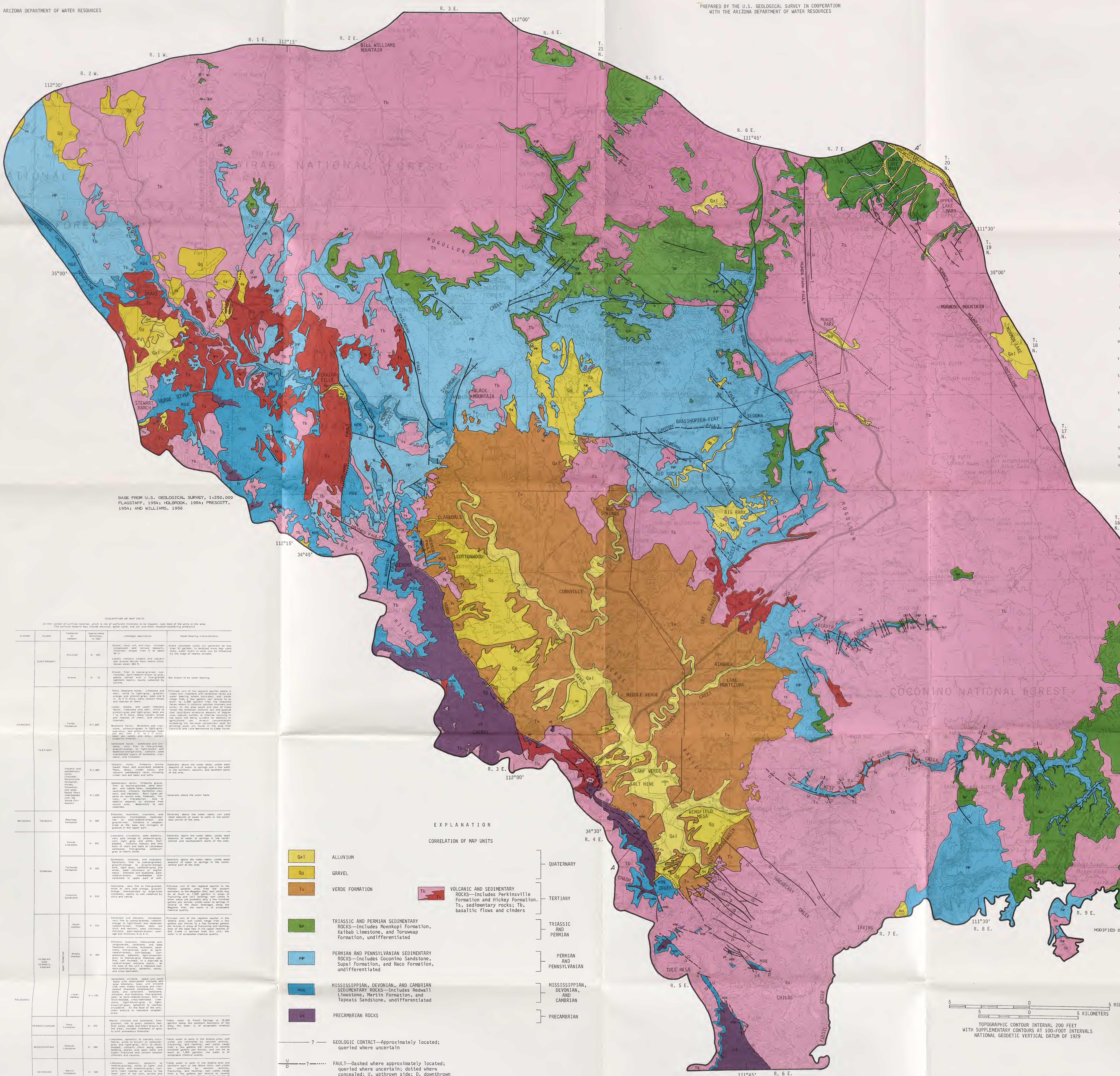
Survey Bulletin

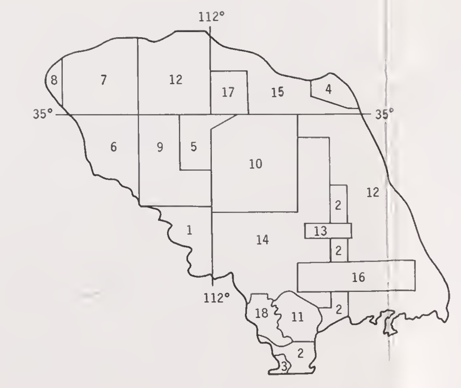
PREPARED BY THE U.S. GEOLOGICAL SURVEY IN COOPERATION
WITH THE ARIZONA DEPARTMENT OF WATER RESOURCES



BASE FROM U.S. GEOLOGICAL SURVEY, 1:250,000
FLAGSTAFF, 1954; HOLBROOK, 1954; PRESCOTT,
1954; AND WILLIAMS, 1956

MODIFIED BY G. W. LEVINGS AND S. J. OWEN-JOYCE, 1980

TOPOGRAPHIC CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100-FOOT INTERVALS
NATIONAL GEODETIC VERTICAL DATUM OF 1929



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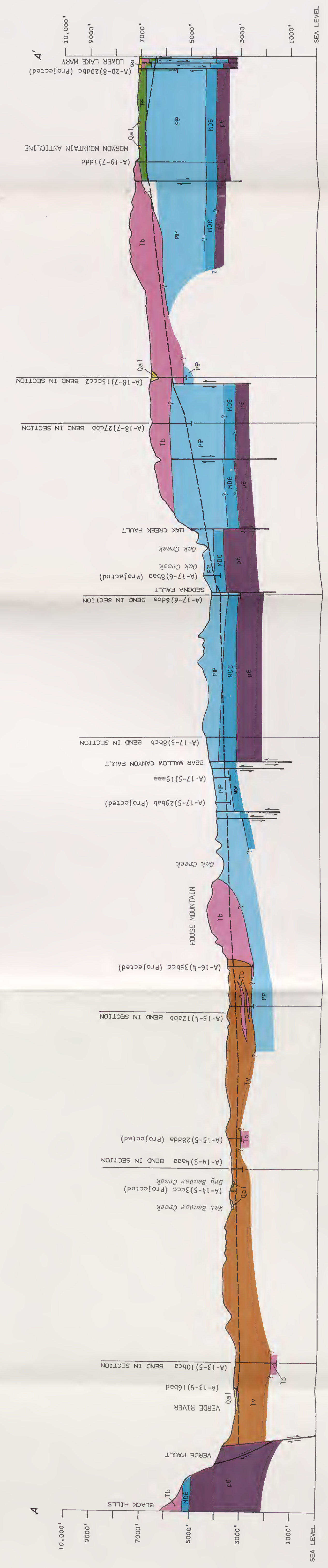


DESCRIPTION OF MAP UNITS

[A thin veneer of surficial material, which is not of sufficient thickness to be mapped, caps most of the units in the area. The surficial material may include alluvium, eolian sand, and soil and other residual-weathering products]

Erathem	System	Formation or member	Approximate thickness, in feet	Lithologic description	Water-bearing characteristics
CENOZOIC	QUATERNARY	Alluvium	0- 400	Gravel, sand, silt, and clay: Includes streamwash and terrace deposits, thickness ranges from 0 to about 50 ft. Locally contains cinders and volcanic ash around Munds Park where thicknesses attain 400 ft.	Where saturated yields will generally be less than 50 gal/min, in localized areas may yield more, water levels in wells may be influenced by the stage of nearby streams.
		Gravel	0- 70	Gravel, fine- to coarse-grained, subrounded, dark-reddish-brown to gray, poorly sorted with a fine-grained sediment matrix; locally cemented by caliche.	Not known to be water bearing.
	TERTIARY	Verde Formation	0-1,800	Thick limestone facies: Limestone and marl, white to light-gray, grayish-orange and pinkish-gray; beds are 6 in. to 5 ft thick, many contain lenses and nodules of chert. Lower, middle, and upper limestone facies: Limestone and marl, white to pinkish-gray and light-gray; beds are 1 to 10 ft thick, many contain lenses and nodules of chert, and solution channels. Mudstone facies: Mudstone and claystone, yellowish-green to light-gray, pale-olive, and yellowish-orange; beds are less than 1 in. to 5 ft thick, some are sandy and silty, contain evaporite minerals. Sandstone facies: Sandstone and siltstone, very fine to fine-grained, grayish-orange to light-brown and moderate-orange-pink; contains some interbedded layers of mudstone, claystone, and limestone.	Principal unit of the regional aquifer where it crops out; limestone and sandstone facies are water bearing where saturated; well yields range from a few gallons per minute to as much as 2,000 gal/min from the limestone facies where it contains solution channels and joints; in the area south and east of Camp Verde the formation contains salt and gypsum that contribute excessive amounts of magnesium, sodium, sulfate, or chloride resulting in the water not being suitable for domestic or agricultural use. Arsenic concentrations exceeding the maximum contaminant level for drinking water are found in the area from Cornville and Lake Montezuma to Camp Verde.
		Volcanic and sedimentary rocks (includes Perkinsville Formation, Hickey Formation, and some basalt flows interbedded with the Verde Formation)	0-1,400	Volcanic rocks: Primarily olivine basalt flows and associated andesite flows, dikes, cinder cones, and volcanic sedimentary rocks including cinder and ash beds and tuffs.	Generally above the water table; yields small amounts of water to springs and a few wells in the northern, eastern, and southern parts of the area.
			0-1,000	Sedimentary rocks: Primarily gravel, fine- to coarse-grained, some boulder, and cobble beds, conglomerate, sandstone, siltstone, bentonitic clay, marl, and limestone. Rock types depend on source area, Paleozoic, Tertiary, or Precambrian. Size of material depends on distance from source area. Moderately to well cemented.	Generally above the water table.
MESOZOIC	TRIASSIC	Moenkopi Formation	0- 400	Siltstone, mudstone, claystone, and sandstone; interbedded, moderate-red to pale-reddish-brown and grayish-red. Contains e conglomerate at the base and stringers of gypsum in the upper part.	Generally above the water table; can yield small amounts of water to wells in the northeast corner of the area.
PALEOZOIC	PERMIAN	Kaibab Limestone	0- 400	Limestone, crystalline, some dolomitic, very pale orange to yellowish-gray, very light gray and white, thin-bedded. Contains nodules and thin beds of chert and beds of calcareous sandstone, fine-grained, yellowish-gray to nearly white.	Generally above the water table; yields small amounts of water to springs in the north-central and southeastern parts of the area.
		Toroweap Formation	0- 350	Sandstone, siltstone, and mudstone. Sandstone, fine- to coarse-grained, grayish-orange to grayish-orange-pink, light gray, yellowish-gray and white, some calcareous or argillaceous. Siltstone and mudstone, pale-reddish-brown; interbedded with sandstone in upper part of unit.	Generally above the water table; yields small amounts of water to springs in the north-central part of the area.
		Coconino Sandstone	0- 650	Sandstone, very fine to fine-grained, white to very pale orange, grayish-orange; characterized by large-scale crossbeds, weakly to well cemented by silica and calcite.	Principal unit of the regional aquifer in the Plateau uplands area from the eastern boundary to the Mogollon Rim; well yields may be as much as 1,000 gal/min in areas of fracturing and (or) faulting; well yields in other areas are probably only a few hundred gallons per minute; yields water to springs in several of the major drainages along the Mogollon Rim; the water is of acceptable chemical quality.
	PERMIAN AND PENNSYLVANIAN	Supai Formation: Upper member	0- 625	Sandstone and siltstone. Sandstone, very fine to coarse-grained, reddish-orange to light-brown and moderate-reddish-brown, friable; beds are thick and massive, some calcareous. Siltstone, pale-reddish-brown; average bed thickness 6 to 8 ft.	Principal unit of the regional aquifer in the Sedona area; well yields range from a few gallons per minute to a few hundred gallons per minute in areas of fracturing and faulting; most of the base flow in the upper reaches of Oak Creek is derived from this unit; the water is of acceptable chemical quality.
		Supai Formation: Middle member	0- 300	Siltstone, mudstone, intercalated with conglomerate, sandstone, and some limestone; siltstone, mudstone, sandstone, fine-grained, pale- to dark-reddish-brown, thin-bedded. Conglomerate, dolomitic, light-brownish-gray to medium-gray limestone pebbles, well rounded, in a pale-red to reddish-brown siltstone matrix. At the base of the unit a limestone bed, dark-pinkish-gray, aphanitic, sandy, and cross-laminated.	
		Supai Formation: Lower member	0-1,100	Sandstone, siltstone. Upper unit sandstone with intercalated siltstone and some limestone, lower unit siltstone with some shaley mudstone and intercalated limestone conglomerate, limestone, and sandstone. Sandstone, siltstone, and mudstone, fine-grained, pale- to dark-reddish-brown, thin- to thick-bedded, cross-laminated. Limestone, light-bluish-gray to light-brownish-gray, aphanitic to coarsely crystalline. At the base of the unit, chert breccia or limestone conglomerate.	
	PENNSYLVANIAN	Naco Formation	0- 475	Mainly siltstone and sandstone, fine-grained, red to gray; contains reddish sandy shale and chert breccia at the base; includes interbeds of gray to pink arenaceous limestone.	Yields water to Fossil Springs at 18,600 gal/min along the southern boundary of the area; the water is of acceptable chemical quality.
	MISSISSIPPIAN	Redwall Limestone	0- 300	Limestone, aphanitic to coarsely crystalline, white to bluish- or yellowish-gray and light-gray, thin- to thick-bedded; contains chert along some bedding planes and some beds are highly fractured and contain solution channels and caverns.	Yields water to wells in the Sedona area; well yields are controlled by solution activity, fracturing, and faulting; well yields range from a few gallons per minute to several hundred gallons per minute, and can be as much as 1,000 gal/min; the water is of acceptable chemical quality.
	DEVONIAN	Martin Formation	0- 500	Limestone, dolomitic, aphanitic to medium-grained, white to light- and dark-gray and brownish-gray; contains chert nodules or lenses in the lower part of the unit, purple and red mottling at the top due to intercalated shaley mudstones and platy siltstones.	Yields water to wells in the Sedona area and northern part of the Black Hills; well yields are controlled by solution activity, fracturing, and faulting; well yields range from a few gallons per minute to several hundred gallons per minute; major source of springs along the east flank of the Black Hills; the water is of acceptable chemical quality.
	CAMBRIAN	Tapeats Sandstone	0- 150	Sandstone, siltstone, and mudstone. Sandstone, medium- to very coarse grained, dusky-red to dark-reddish-brown, crossbedded; contains lenses of conglomerate. Siltstone, shaley, and mudstone, limy to dolomitic, yellowish-gray to pale-olive and dusky-yellow Moderately to well cemented.	Probably yields small amounts of water to wells and springs.
PRECAMBRIAN		Metamorphic and granitic rocks	20,000	Metamorphosed volcanic and tuffaceous sedimentary rocks intruded by diorite and quartz porphyry.	May yield small amounts of water to wells and springs if fractured.

EXPLANATION

CORRELATION OF MAP UNITS

Symbol	Unit	Age
Qal	ALLUVIUM	QUATERNARY
Qg	GRAVEL	QUATERNARY
Tv	VERDE FORMATION	TERTIARY
Tb, Ts	VOLCANIC AND SEDIMENTARY ROCKS—Includes Perkinsville Formation and Hickey Formation. Ts, sedimentary rocks; Tb, basaltic flows and cinders	TERTIARY
TRP	TRIASSIC AND PERMIAN SEDIMENTARY ROCKS—Includes Moenkopi Formation, Kaibab Limestone, and Toroweap Formation, undifferentiated	TRIASSIC AND PERMIAN
PP	PERMIAN AND PENNSYLVANIAN SEDIMENTARY ROCKS—Includes Coconino Sandstone, Supai Formation, and Naco Formation, undifferentiated	PERMIAN AND PENNSYLVANIAN
MDE	MISSISSIPPIAN, DEVONIAN, AND CAMBRIAN SEDIMENTARY ROCKS—Includes Redwall Limestone, Martin Formation, and Tapeats Sandstone, undifferentiated	MISSISSIPPIAN, DEVONIAN, AND CAMBRIAN
pC	PRECAMBRIAN ROCKS	PRECAMBRIAN

——?—— GEOLOGIC CONTACT—Approximately located; queried where uncertain

U/D ——?—— FAULT—Dashed where approximately located; queried where uncertain; dotted where concealed; U, upthrown side; D, downthrown side

BOUNDARY OF THE UPPER VERDE RIVER AREA

MONOCLINE—Dashed where approximately located

ANTICLINE—Dashed where approximately located

GENERALIZED GEOLOGY IN THE UPPER VERDE RIVER AREA

BULLETIN 2
PLATE 2

111°30'

PREPARED BY THE U.S. GEOLOGICAL SURVEY IN COOPERATION
WITH THE ARIZONA DEPARTMENT OF WATER RESOURCES

EXPLANATION

- WELL THAT PENETRATES THE REGIONAL AQUIFER—Figure indicates number of wells at this location
- WELL THAT PENETRATES AN AQUIFER OTHER THAN THE REGIONAL AQUIFER—Figure indicates number of wells at this location
- SPRING THAT ISSUES FROM THE REGIONAL AQUIFER
- SPRING THAT ISSUES FROM AN AQUIFER OTHER THAN THE REGIONAL AQUIFER
- 4400 — POTENTIOMETRIC CONTOUR, REGIONAL AQUIFER—Shows altitude at which water level would have stood in most tightly cased wells. Dashed where approximately located. Contour interval 200 feet with supplemental contours at 100-foot intervals. National Geodetic Vertical Datum of 1929
- U D — MAJOR FAULT—A fault with hydrologic significance, affects the occurrence and (or) movement of ground water. Dashed where approximately located; U, upthrown side; D, downthrown side
- GENERALIZED DIRECTION OF GROUND-WATER FLOW
- GROUND-WATER DIVIDE
- BOUNDARY OF THE UPPER VERDE RIVER AREA

LOCATION OF SELECTED WELLS AND SPRINGS AND APPROXIMATE ALTITUDE OF THE WATER LEVEL IN WELLS THAT TAP THE REGIONAL AQUIFER IN THE UPPER VERDE RIVER AREA, 1980

Ar 47
#2

EXPLANATION

340P / Tv

WELL THAT PENETRATES THE REGIONAL AQUIFER—First entry, 340, is dissolved-solids concentration in milligrams per liter (P, indicates the well was sampled prior to 1976). Second entry, Tv, is principal geologic formation from which the well obtains its water (Qal, alluvium; Tv, Verde Formation; Pc, Coconino Sandstone; PIPs, Supai Formation; Mr, Redwall Limestone; Dm, Martin Formation)

170P / Pc(?)

SPRING THAT ISSUES FROM THE REGIONAL AQUIFER—First entry, 170, is dissolved-solids concentration in milligrams per liter (P, indicates the spring was sampled prior to 1976). Second entry, Pc, is principal geologic formation from which the spring obtains its water (Tv, Verde Formation; Pc, Coconino Sandstone; PIPs, Supai Formation; IPn, Naco Formation; Mr, Redwall Limestone; Dm, Martin Formation); queried where uncertain

8 73 / 284 / 79-06-12

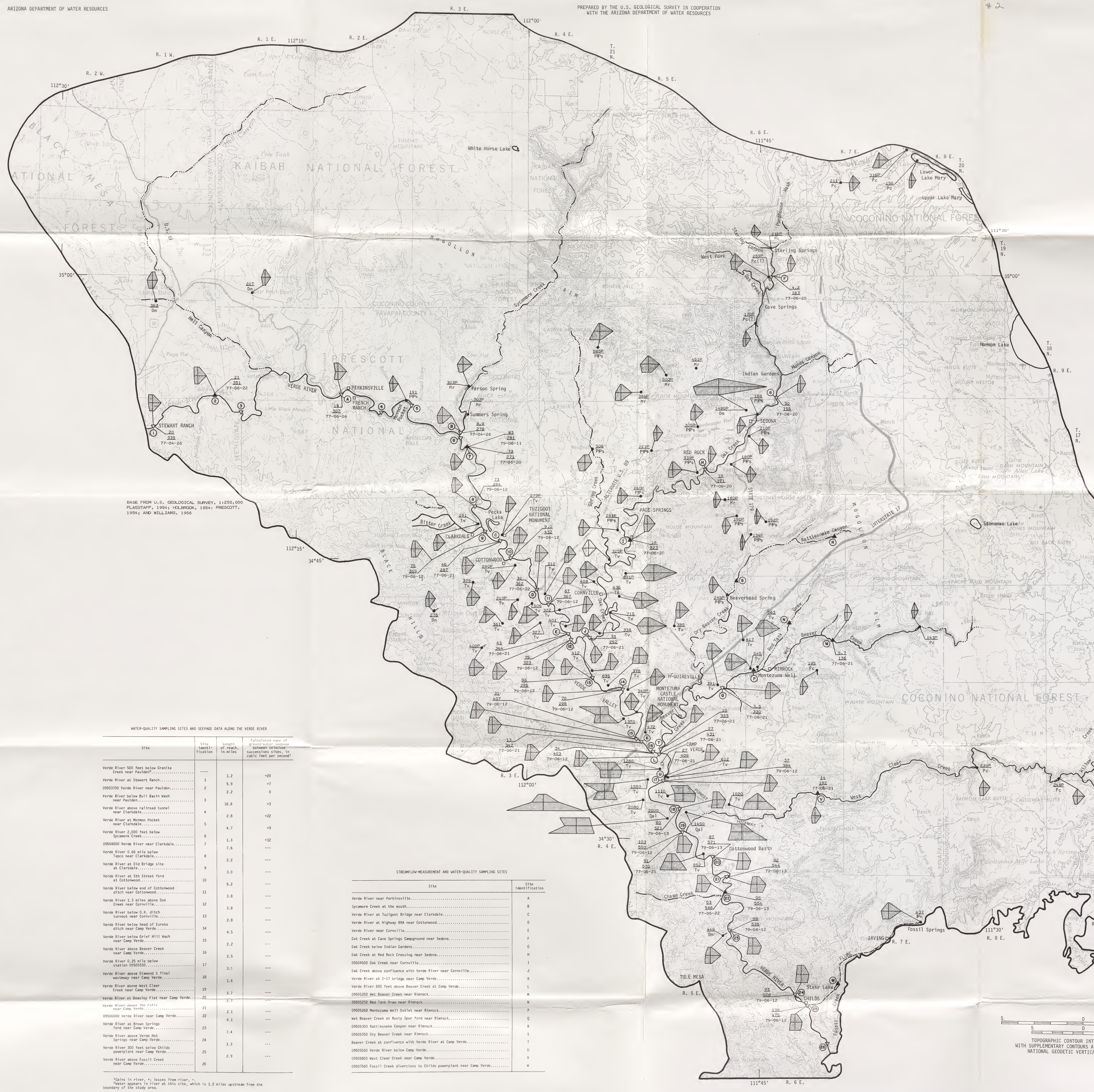
MISCELLANEOUS STREAMFLOW-MEASUREMENT AND WATER-QUALITY SAMPLING SITE—First entry, 73, is stream discharge in cubic feet per second. Second entry, 284, is dissolved-solids concentration in milligrams per liter. Third entry, 79-06-12, is date of the measurement and sample, in year, month, and day. Letter or number next to symbol is site identification (see tables)

I 16 / 223 / 77-06-20

CONTINUOUS HYDROLOGIC DATA-COLLECTION SITE—First entry, 16, is stream discharge in cubic feet per second. Second entry, 223, is dissolved-solids concentration in milligrams per liter. Third entry

111°30'

PREPARED BY THE U.S. GEOLOGICAL SURVEY IN COOPERATION
WITH THE ARIZONA DEPARTMENT OF WATER RESOURCES



BASE FROM U.S. GEOLOGICAL SURVEY, 1:250,000
FLAGSTAFF, 1954; HOLBROOK, 1954; PRESCOTT,
1954; AND WILLIAMS, 1956

EXPLANATION

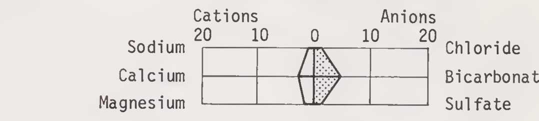
● 340P / Tv — WELL THAT PENETRATES THE REGIONAL AQUIFER—First entry, 340, is dissolved-solids concentration in milligrams per liter (P, indicates the well was sampled prior to 1976). Second entry, Tv, is principal geologic formation from which the well obtains its water (Qal, alluvium; Tv, Verde Formation; Pc, Coconino Sandstone; PPs, Supai Formation; Mr, Redwall Limestone; Dm, Martin Formation)

170P / Pc(?) — SPRING THAT ISSUES FROM THE REGIONAL AQUIFER—First entry, 170, is dissolved-solids concentration in milligrams per liter (P, indicates the spring was sampled prior to 1976). Second entry, Pc, is principal geologic formation from which the spring obtains its water (Tv, Verde Formation; Pc, Coconino Sandstone; PPs, Supai Formation; Pn, Naco Formation; Mr, Redwall Limestone; Dm, Martin Formation); queried where uncertain

8 ▽ 73 / 284 / 79-06-12 — MISCELLANEOUS STREAMFLOW-MEASUREMENT AND WATER-QUALITY SAMPLING SITE—First entry, 73, is stream discharge in cubic feet per second. Second entry, 284, is dissolved-solids concentration in milligrams per liter. Third entry, 79-06-12, is date of the measurement and sample, in year, month, and day. Letter or number next to symbol is site identification (see tables)

I ▲ 16 / 223 / 77-06-20 — CONTINUOUS HYDROLOGIC DATA-COLLECTION SITE—First entry, 16, is stream discharge in cubic feet per second. Second entry, 223, is dissolved-solids concentration in milligrams per liter. Third entry, 77-06-20, is date of the measurement and sample, in year, month, and day. Letter or number next to symbol is site identification (see tables)

CHEMICAL-QUALITY DIAGRAM—Shows major chemical constituents in milliequivalents per liter. The diagrams are in a variety of shapes and sizes, which provides a means of comparing, correlating, and characterizing types of water. Stippled diagram indicates surface-water sample. Shaded diagram indicates ground-water sample



REACH IN WHICH STREAMFLOW IS PERENNIAL

REACH IN WHICH STREAMFLOW IS EPHEMERAL OR INTERRUPTED

BOUNDARY OF THE UPPER VERDE RIVER AREA

WATER-QUALITY SAMPLING SITES AND SEEPAGE DATA ALONG THE VERDE RIVER

Site	Site identification	Length of reach, in miles	Calculated rate of ground-water seepage between selected successives sites, in cubic feet per second[1]
Verde River 500 feet below Granite Creek near Paulden[2]	----		
		1.2	+20
Verde River at Stewart Ranch	1		
		5.9	+7
09503700 Verde River near Paulden	2		
		2.2	0
Verde River below Bull Basin Wash near Paulden	3		
		16.6	+3
Verde River above railroad tunnel near Clarkdale	4		
		2.8	+22
Verde River at Mormon Pocket near Clarkdale	5		
		4.7	+9
Verde River 2,000 feet below Sycamore Creek	6		
		1.3	+12
09504000 Verde River near Clarkdale	7		
		7.6	---
Verde River 0.66 mile below Tapco near Clarkdale	8		
		2.2	---
Verde River at Old Bridge site at Clarkdale	9		
		3.0	---
Verde River at 5th Street ford at Cottonwood	10		
		5.2	---
Verde River below end of Cottonwood ditch near Cottonwood	11		
		3.8	---
Verde River 1.3 miles above Oak Creek near Cornville	12		
		3.8	---
Verde River below O.K. ditch turnout near Cornville	13		
		2.8	---
Verde River below head of Eureka ditch near Camp Verde	14		
		4.5	---
Verde River below Grief Hill Wash near Camp Verde	15		
		2.2	---
Verde River above Beaver Creek near Camp Verde	16		
		2.5	---
Verde River 0.25 mile below station 09505550	17		
		3.9	---
Verde River above Diamond S final wasteway near Camp Verde	18		
		1.6	---
Verde River above West Clear Creek near Camp Verde	19		
		3.7	---
Verde River at Beasley Flat near Camp Verde	20		
		2.7	---
Verde River above The Falls near Camp Verde	21		
		2.1	---
09506000 Verde River near Camp Verde	22		
		4.1	---
Verde River at Brown Springs ford near Camp Verde	23		
		7.4	---
Verde River above Verde Hot Springs near Camp Verde	24		
		1.3	---
Verde River 300 feet below Childs powerplant near Camp Verde	25		
		2.9	---
Verde River above Fossil Creek near Camp Verde	26		

[1]Gains in river, +; losses from river, -.
[2]Water appears in river at this site, which is 1.2 miles upstream from the boundary of the study area.

STREAMFLOW-MEASUREMENT AND WATER-QUALITY SAMPLING SITES

Site	Site identification
Verde River near Perkinsville	A
Sycamore Creek at the mouth	B
Verde River at Tuzigoot Bridge near Clarkdale	C
Verde River at Highway 89A near Cottonwood	D
Verde River near Cornville	E
Oak Creek at Cave Springs Campground near Sedona	F
Oak Creek below Indian Gardens	G
Oak Creek at Red Rock Crossing near Sedona	H
09504500 Oak Creek near Cornville	I
Oak Creek above confluence with Verde River near Cornville	J
Verde River at I-17 bridge near Camp Verde	K
Verde River 600 feet above Beaver Creek at Camp Verde	L
09505200 Wet Beaver Creek near Rimrock	M
09505250 Red Tank Draw near Rimrock	N
09505260 Montezuma Well Outlet near Rimrock	P
Wet Beaver Creek at Rusty Spur ford near Rimrock	Q
09505300 Rattlesnake Canyon near Rimrock	R
09505350 Dry Beaver Creek near Rimrock	S
Beaver Creek at confluence with Verde River at Camp Verde	T
09505550 Verde River below Camp Verde	U
09505800 West Clear Creek near Camp Verde	V
09507500 Fossil Creek diversions to Childs powerplant near Camp Verde	W

5 0 5 MILES
5 0 5 KILOMETERS

TOPOGRAPHIC CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100-FOOT INTERVALS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

SURFACE-WATER AND GROUND-WATER QUALITY AND SEEPAGE RELATIONS IN THE UPPER VERDE RIVER AREA, 1976-80

BULLETIN 3
PLATE 1

XPLANATION

RELATION OF MAP UNITS

QUATERNARY

TERTIARY

PERMIAN, PENNSYLVANIAN, MISSISSIPPIAN,
DEVONIAN, AND CAMBRIAN

PRECAMBRIAN

111°52'30"
BASE FROM U.S. GEOLOGICAL SURVEY 1:24,000
CAMP VERDE, 1969, AND HORNER MOUNTAIN, 1967

50'00" 47'30" 111°45'00"

1 1/2 0 1 MILE

1 .5 0 1 KILOMETER

CONTOUR INTERVALS 20 AND 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

EXPLANATION

CORRELATION OF MAP UNITS

Qal, Qg — QUATERNARY

Tv, Tb — TERTIARY

Pz — PERMIAN, PENNSYLVANIAN, MISSISSIPPIAN, DEVONIAN, AND CAMBRIAN

p€ — PRECAMBRIAN

DESCRIPTION OF MAP UNITS

Qal — ALLUVIUM—Unconsolidated gravel, sand, silt, and clay; mostly channel, flood-plain, and terrace deposits in and near streams, includes slopewash off the Black Hills

Qg — GRAVEL—Unconsolidated and semiconsolidated pebbles, cobbles, boulders, some sand, silt, and clay; forms talus deposits, alluvial-fan deposits, and the alluvial veneer on pediment surfaces

Unconformity

Tv — VERDE FORMATION—Consolidated and semiconsolidated lacustrine and fluviatile deposits. Diverse lithology of interfingering beds of limestone, mudstone, claystone, sandstone, conglomerate, and tuffaceous rocks

Tb — VOLCANIC ROCKS—Mainly basalt and dacite porphyry. Includes basaltic lava flows, basalt and dacite dikes, ashflow tuff, and related pyroclastic deposits

Unconformity

Pz — PALEOZOIC ROCKS—Includes the Supai Formation, Redwall Limestone, Martin Formation, and Tapeats Sandstone, undivided, which underlie the Verde Formation in the subsurface on the east side of the valley. Redwall Limestone, Martin Formation, and Tapeats Sandstone crop out west of the Verde fault

Unconformity

p€ — GRANITIC ROCKS—Diorite and quartz porphyry igneous rocks

GEOLOGIC CONTACT—Dashed where approximately located

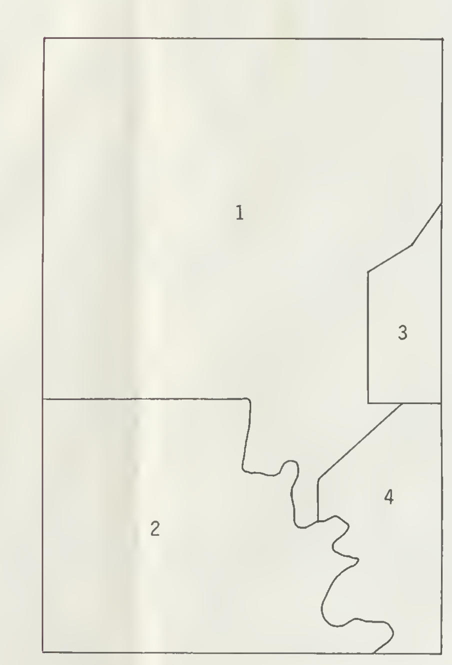
U D — FAULT—Long dashed where approximately located; short dashed where inferred; dotted where concealed. U, upthrown side; D, downthrown side

20 — LINE OF EQUAL THICKNESS OF ALLUVIUM—Dashed where approximately located. Contour interval 10 feet

A A' — LINE OF PROFILE

•3 — WELL—Figure, 3, indicates number of wells at this location

SPRING



Geologic map modified by S. J. Owen-Joyce, 1982, from:

1. Twenter, F. R., and Metzger, D. G., 1963, Geology and ground water in Verde Valley—the Mogollon Rim region, Arizona: U.S. Geological Survey Bulletin 1177, 132 p.

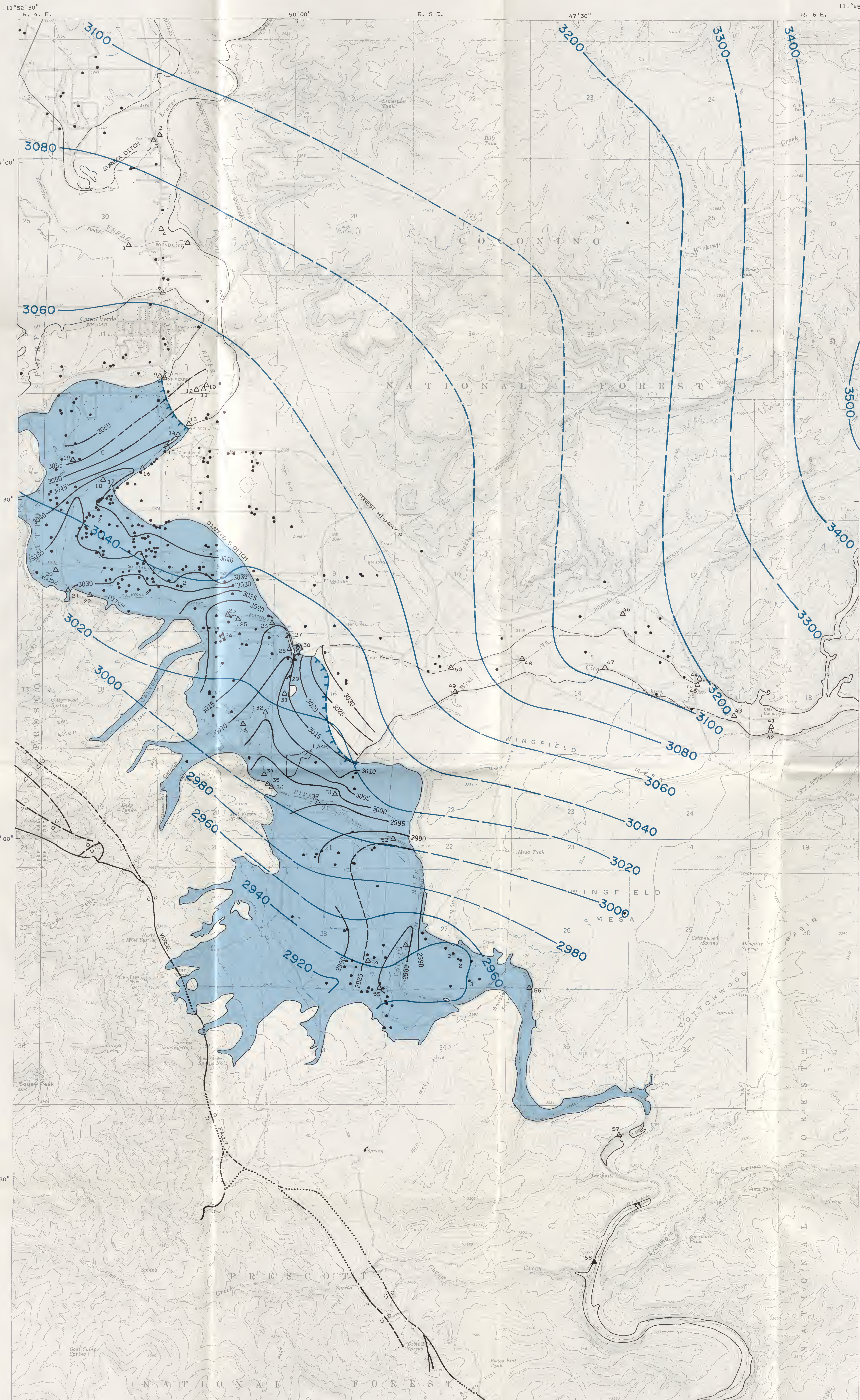
2. Wolfe, E. W., and others, 1980, U.S. Geological Survey, written commun.

3. Ulrich, G. E., and Bielski, A. M., 1983, Mineral resource potential map of the West Clear Creek Roadless Area, Yavapai and Coconino Counties, Arizona: U.S. Geological Survey Miscellaneous Field Studies Map MF-1555-A, scale 1:24,000.

4. Lewis, R. E., 1983, Geology of the Hackberry Mountain Volcanic Center, Yavapai County, Arizona: California Institute of Technology, unpublished doctoral thesis, 295 p.

GENERALIZED GEOLOGY AND ISOPACH OF THE ALLUVIUM, CAMP VERDE AREA, ARIZONA

BULLETIN 3
PLATE 2



BASE FROM U.S. GEOLOGICAL SURVEY 1:24,000
CAMP VERDE, 1969, AND HORNER MOUNTAIN, 1967

1 1/2 0 1 MILE

1 .5 0 1 KILOMETER

CONTOUR INTERVALS 20 AND 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

HYDROLOGY BY S. J. OWEN-JOYCE, 1982

EXPLANATION

3020 — WATER-TABLE CONTOUR—Shows altitude of water table in the alluvium. Dashed where approximately located. Contour interval 5 feet. National Geodetic Vertical Datum of 1929

3100 — POTENTIOMETRIC CONTOUR—Shows altitude at which water level would have stood in tightly cased well in the Verde Formation. Long dashed where approximately located; short dashed where inferred. Contour interval 20 and 100 feet. National Geodetic Vertical Datum of 1929

•3 WELL—Figure, 3, indicates number of wells at this location

SPRING

△37 MISCELLANEOUS STREAMFLOW-MEASUREMENT SITE—Number, 37, corresponds to that in table 1

▲58 STREAMFLOW-GAGING STATION—Operated by the U.S. Geological Survey. Number, 58, corresponds to that in table 1

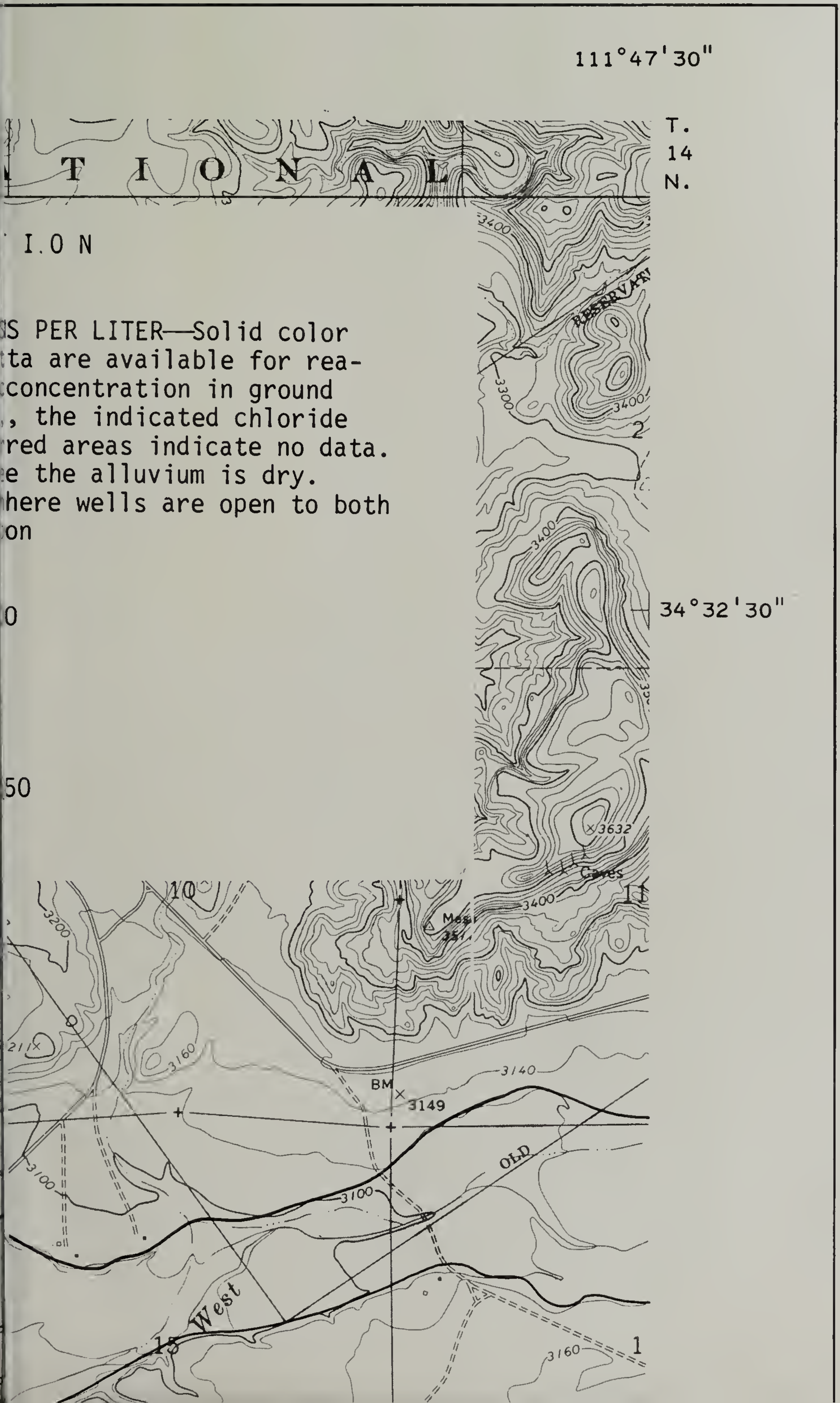
WATER-BUDGET AREA

GEOLOGIC CONTACT—Dashed where approximately located

U D FAULT—Long dashed where approximately located; short dashed where inferred; dotted where concealed. U, upthrown side; D, downthrown side

BOUNDARY OF THE ALLUVIUM FOR CALCULATING THE WATER-BUDGET WHERE THE AQUIFER IS CONTINUOUS

ALTITUDE OF THE WATER TABLE IN THE ALLUVIUM, ALTITUDE OF THE POTENTIOMETRIC SURFACE IN THE VERDE FORMATION, AND LOCATION OF SELECTED WELLS, SPRINGS, AND STREAMFLOW-MEASUREMENT SITES, CAMP VERDE AREA, ARIZONA, WINTER 1981

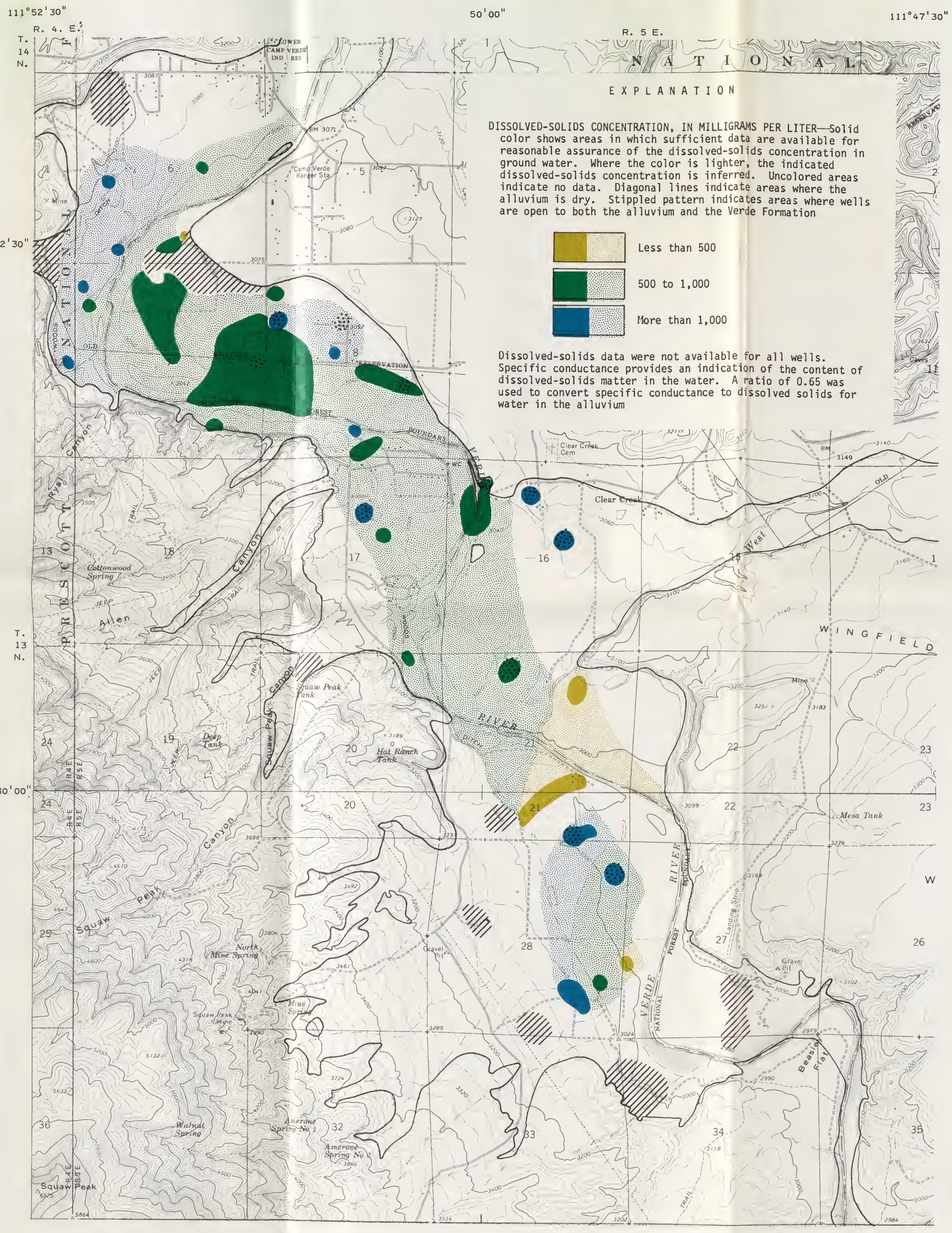


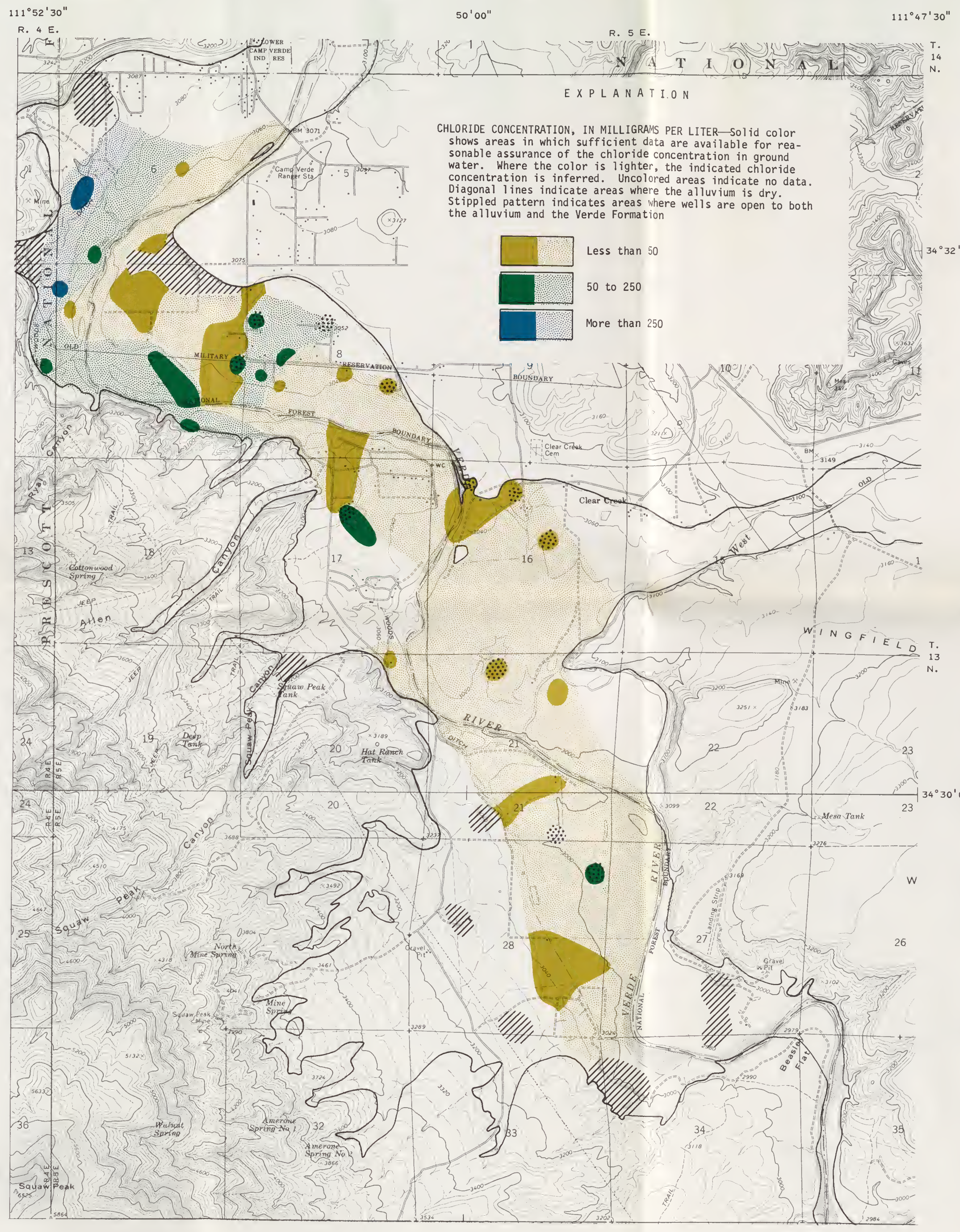
I.O N

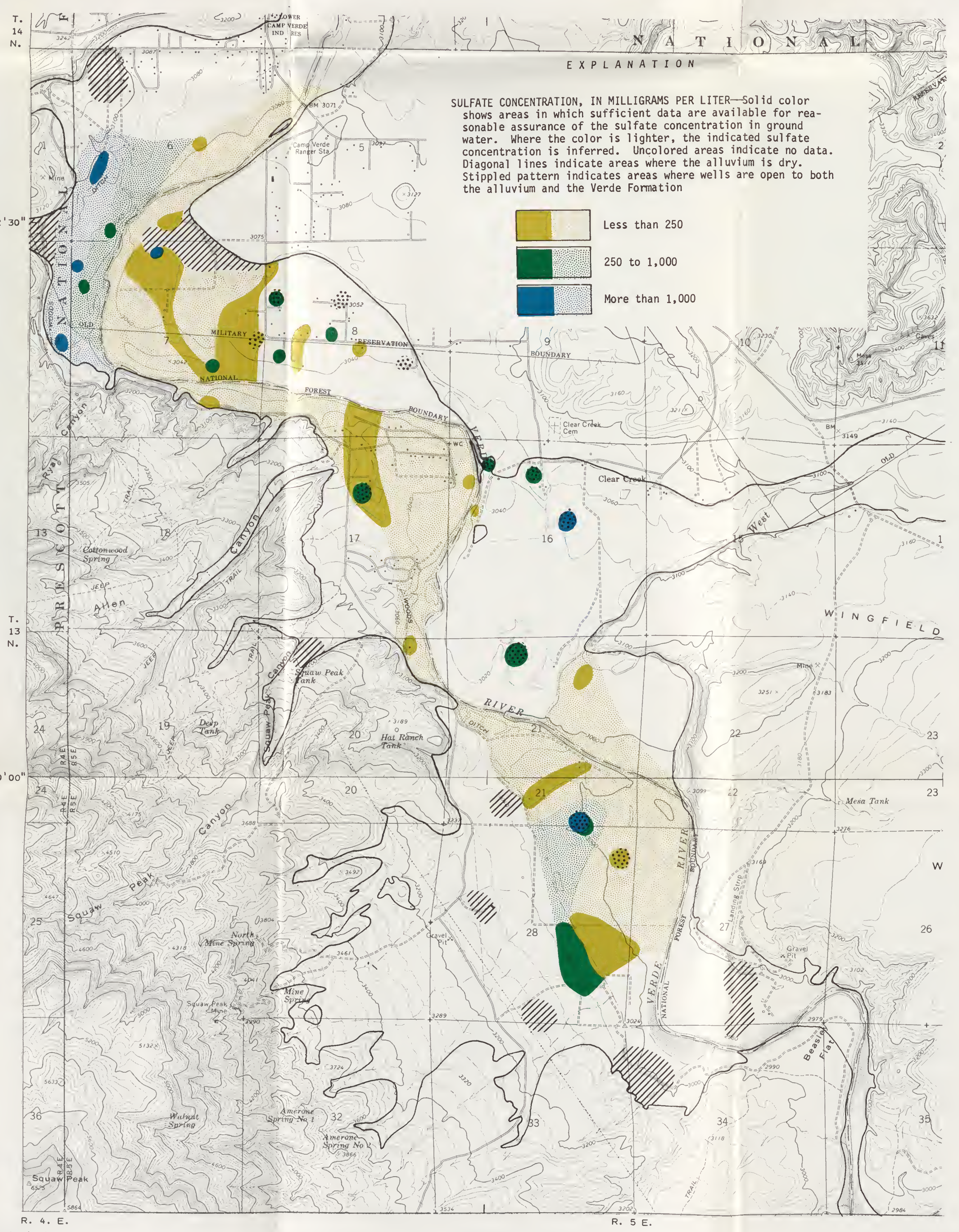
S PER LITER—Solid color
ta are available for rea-
concentration in ground
, the indicated chloride
red areas indicate no data.
e the alluvium is dry.
here wells are open to both
on

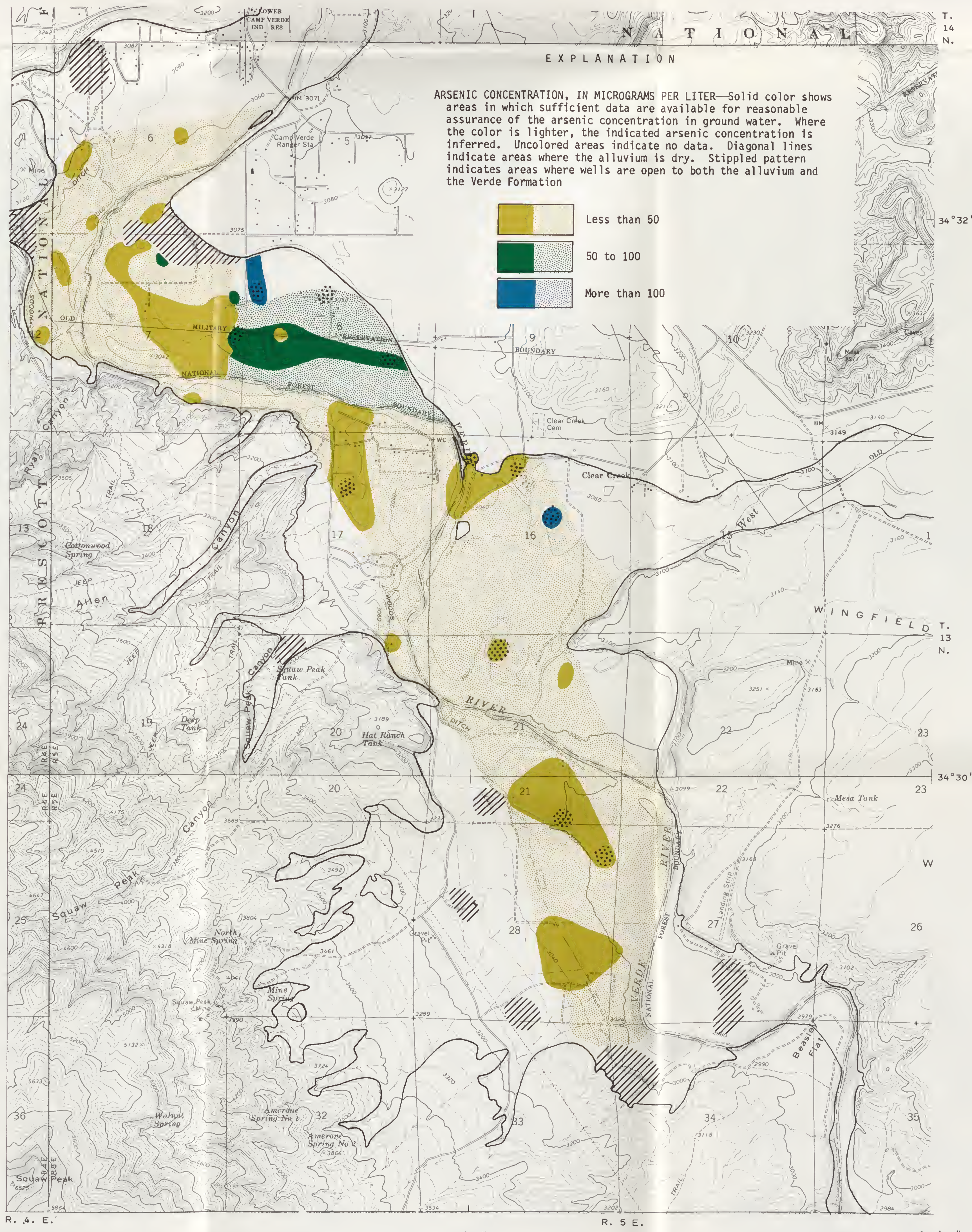
0

50









BASE FROM U.S. GEOLOGICAL SURVEY 1:24,000
CAMP VERDE, 1969, AND HORNER MOUNTAIN, 1967

1 1/2 0 1 MILE
1 .5 0 1 KILOMETER

CONTOUR INTERVALS 20 AND 40 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

DISSOLVED-SOLIDS, CHLORIDE, SULFATE, AND ARSENIC CONCENTRATIONS IN GROUND-WATER IN THE ALLUVIUM, CAMP VERDE AREA, ARIZONA, WINTER 1981